

## PROGRAMMING DOCUMENTS

# ENERGY ENGINEERING ANALYSIS PROGRAM

# **ENERGY SAVINGS OPPORTUNITY SURVEY**

# FORT HUACHUCA, ARIZONA 1994

## **VOLUME III**

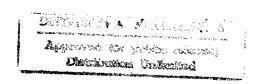
#### PREPARED FOR

DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA

#### PREPARED BY

KELLER & GANNON ENGINEERS • ARCHITECTS 1453 MISSION STREET, SAN FRANCISCO, CA 94103

CONTRACT NO. DACA05-C-92-0155



#### DEPARTMENT OF THE ARMY

CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

REPLY TO ATTENTION OF:

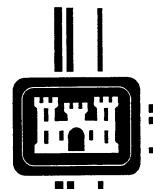
TR-I Library

17 Sep 1997

Based on SOW, these Energy Studies are unclassified/unlimited. Distribution A. Approved for public release.

Marie Wakeffeld,

Librarian Engineering



# 19971017 211

## PROGRAMMING DOCUMENTS

## ENERGY ENGINEERING ANALYSIS PROGRAM

## **ENERGY SAVINGS OPPORTUNITY SURVEY**

# FORT HUACHUCA, ARIZONA 1994

## **VOLUME III**

DIC QUALITY INSPECTED 2

#### PREPARED FOR

DEPARTMENT OF THE ARMY SACRAMENTO DISTRICT, CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA

#### PREPARED BY

KELLER & GANNON ENGINEERS • ARCHITECTS 1453 MISSION STREET, SAN FRANCISCO, CA 94103

CONTRACT NO. DACA05-C-92-0155

## **EEAP Energy Savings Opportunity Survey Fort Huachuca, Arizona**

## **Table of Contents**

WORK REQUEST 1: Building Envelope Modifications

- EHSC Form 4283-1
- Supporting Data (20 Sheets)

WORK REQUEST 2: Gas Engine-Driven Chiller Retrofit

- EHSC Form 4283-1
- Supporting Data (4 Sheets)

WORK REQUEST 3: Building HVAC Control Modifications and High-Efficiency Motor Retrofits

- EHSC Form 4283-1
- Supporting Data (13 Sheets)

WORK REQUEST 4: Lighting Fixture and Control Retrofits

- EHSC Form 4283-1
- Table of Contents (2 Sheets)
- Supporting Data (54 Sheets)

**EEAP Energy Savings Opportunity Survey** Fort Huachuca, Arizona Work Request 1 **Building Envelope Modifications** F:\PROJ\1640313\WORD\WORKREQ.COV 950210

WORK REQUEST (IFS-M)
(For use of this form, see AR 420-17 and DA PAM 420-6; the proponent agency is USACE.)

	CUSTOMER DOC	5														DATE	Щ	
PART A (See Instructions)	ID SE	SERIAL C T T NUMBER			ω.	SHORT JOB DESCRIPTION	B DES(	SRIPTIC	Z						ð	MOM	z	χ
	FEE	5 P		INSULA	T E WA	A L L	& R O	0	F	+ C O A	A T	R	ROOFS	FS		$\exists$		$\Box$
INSTALLATION					BUILDING / FACILITY NUMBERS	CILITY	UMBE	S										
FACILITIES	1 2	3		4	5		9		7			8		6			9	
1 H U A	5 5 4 4 2 0 2	0 0 4 3 0	0 8 3 5	1 0 0 5	2 6 3	1 9 1	1 1	4							$\pm$	$\perp$		
3 2								+	+							$\pm$		F
REMARKS: This Work Requ	This Work Request is a result of the EEAP, ESOS conducted by Keller & Gannon under Contract No. DACA05-C-92-0155	EEAP, ESO	S conduc	ted by Kell	er & Ganno	n under	Cont	act N	o. DAC	A05	C-92	0155						
Economic analy	Economic analysis results are: \$30,025 energy cost saved per year for an Investment of \$111,681; SIR = 3.45; Payback Period = 3.72 years.	,025 energy	cost save	ed per year	for an Inves	tment	f \$11	,681;	SIR =	3.45;	Pay	)ack	Perio	3.	72 ye	ars.		
INSTALLATION NAME:			<b>CUSTOMER NAME</b>	RINAME			L.	POC NAME	ME					00 P	1ONE	POC PHONE NUMBER	œ	
FORT HUACHUCA, ARIZONA	۸A	Directorate of Engineering and Housing  W    L   L   I   A   M	of Engine	ering and H	lousing W	771	<b>4</b> -	W	r	ST	TEIN	0 9 N	0 2	5	3 3	-1	8	6 1
7) N	of work requested): Re	fer to the att	ached inf	ormation fo	r details an	speci	fics co	ncerr	ing th	e ans	ilyse		•	į				•
	Install 7,680 SF Blow-In Wall Insulation, 12,800 SF Fiberglass Batt Celling Insulation & Coat 12,800 SF Roof with LO/MII -1 or approved equal.	Il Insulation,	12,800 SI	Fiberglas:	800 SF Fiberglass Batt Celling Insula	g insul	ation .	S C C S S	12,80	S S	Š	E N	Ž Č	<u>-</u>	or app	orove.	ਰ ਰ	ual.
Building 43083: Install 2	install 3, 130 SF of R-30 Fiberglass Batt Celling Insulation between celling Joists. Install 29,982 SF of R-30 Rigid Polyisocyanurate 2 pound per cubic foot Board Roof Insulation.	rglass batt gid Polyisoc	yanurate	Sulation ber	r cubic foot	g joist Board	Roof I	nsulat	ion.									
	Install 78,400 SF of reflective roof coating,	e roof coatin	ig, LO/Mi	LO/MIT-1 or approved equal.	oved equal.													
Building 56301: Install 3	Install 30,000 SF of reflective roof coating, Install 6 979 SF of reflective roof coating 1	e roof coating		LO/MIT-1 or approved equal D/MIT-1 or approved equal	LO/MIT-1 or approved equal.													
					:								:					
	AUTHORIZED REQUESTOR (Type or Print)	or Print)								SIGNATURE	URE							
PART B (Approving Official Only)	APPROVAL ACTION CODE: WORK REQUEST PRIORITY: PROGRAM INDICATOR CODE:	CODE: !IORITY: DR CODE:			SPECIAL INTEREST CODE: ESTIMATED WORK START DATE: ESTIMATED WORK COMPIFTION DATE:	TEREST WORK	CODE: START	DATE:	DATE				A		40	MON		*
	TOOMI MANAGOVI	- CODE:							ا <u>ن</u> د									$\blacksquare$
ENVIRONMENTAL IMPACT YES NO The state of the	WORK TO BE PERFORMED	WORKCLASS	CLASS	FUNDED		APPROVAL AMOUNTS	UNTS	UNEUNDED	DED			Ta ₹	SOR DIRECT AUTOMA	IC R	SOURCE OF FUNDS ST MATIC REIMBURSEN	SOURCE OF FUNDS DIRECT AUTOMATIC REIMBURSEMENT	F	
CONSIDERATION EIS/EIA	IN-HOUSE SELF-HELP		* *			w w							NDED	REIME	FUNDED REIMBURSEMENT	MENT		
INITIATED EIS/EIA COMPLETED	CONTRACT	TOTAL				\$ <b>\$</b>								R FU	OTHER FUND CITATION	NOIT		
DESIGN APPROVAL	ROVAL	DATE	re		APPRO	APPROVAL AUTHORITY	FHORIT	_		М	AP.	APPROVAL ACTION	L ACTI	N O		DATE	ш	
		DA MON	YR -							ı			į		₫-	NOM -	$\dashv$	¥-
(rrease type or print name)	nt name)				(1001)	(ricease type or print neme)	iii naine)					DISAPPROVED	PROVI	Ω	1		┪	-
(Signature)	(					(Signature)												

#### Insulation Retrofit Evaluations for Selected Buildings

Insulation is considered for selected buildings. Energy savings are evaluated using energy simulations employing the Carrier HAP program. Weather data is only available for large cities. El Paso, Texas was selected as the closest city with a somewhat similar climate; results are adjusted based on Fort Huachuca and El Paso meteorological data.

Buildings included in this analysis and insulation retrofits considered for each are:

#### **Building 15544 Instruction Building**

The 'Butler' type building is built on a concrete slab with metal wall panels insulated with 1-inch of fiberglass and gypsum board interior. The roof has the same construction, with suspended acoustical ceiling tiles.

HVAC is provided by a multizone air handling unit fitted with hot and chilled water coils. Chilled water is provided by a package air cooled reciprocating chiller; hot water is provided by a natural gas fired hot water boiler.

Insulation projects evaluated for this building include:

- Retrofit wall Insulation to achieve an insulating value of R-11,
   to be accomplished by installing blow-in insulation from the building interior.
- Retrofit roof insulation to achieve an insulating value of R-30,
   to be accomplished by adding an R-30 layer of fiberglass insulation below the existing roof deck.
- Apply a coating of LO/MIT-1 to roof exterior surface.

#### **Building 20200 Residential Duplex**

The building is constructed on a concrete slab. Walls are wood stud with stucco exterior and gypsum board interior. Originally, walls were insulated with a loose mineral wool which has now settled, removing insulation from the top portions of the walls. Roof construction is on 2"x10" joists with R-11 Batt insulation between; built-up roofing above and gypsum board ceiling, both fixed directly to the joists. Roof insulation is deteriorated due to previous leakage; it is assumed that removal is required prior to the addition of new R-30 fiberglass batts.

Heating is provided by a warm air furnace and cooling is provided by a roof top evaporative cooler. Each of the two units has the same equipment.

Insulation projects evaluated for this building include:

- Retrofit wall Insulation to achieve an insulating value of R-11,
   to be accomplished by installing blow-in insulation from the building exterior, only about 1/2 the
   wall cavities need to be filled; cost estimates are adjusted accordingly.
- Retrofit roof Insulation to achieve an insulating value of R-30,
   to be accomplished by adding R-30 fiberglass batts between ceiling joists when the building requires re-roofing.
- Apply a coating of LO/MIT-1 to roof exterior surface.

#### **Building 43083 Visitor's Quarters**

The Visitor's Quarters is a three-floor, hotel-like building. Walls are constructed of concrete masonry units (CMU), floors are concrete decks and the roof/ceiling is composed of a built-up roof over concrete deck, air space and gypsum-board ceiling. Certain walls of one floor have been insulated on the interior surface with rigid boards on furring strips with a new surface covering.

HVAC is provided in each room via two-pipe fan-coil units on thermostatic controls. Either chilled or hot water is provided to the fan-coil units depending on the season. Hallways and central areas are provided HVAC via air handling units fitted with chilled and hot water coils. The building is split into two service areas, each handled by separate hot water boilers and air cooled reciprocating chillers.

Insulation projects evaluated for this building include:

- Retrofit wall Insulation to achieve an insulating value of R-11,
   to be accomplished by installing rigid fiberglass board insulation between furring strips on interior walls, with new gypsum board covering, prime and finish coatings.
- Retrofit roof Insulation to achieve an insulating value of R-30,
   to be accomplished by adding rigid insulation boards to roof surface when reroofing is required.
- Apply a coating of LO/MIT-1 to roof exterior surface.

#### **Building 51005 Guest House**

The Guest House is similar to the Visitor's Quarters in construction, three-floors with CMU walls, concrete decks and built-up roof. This study investigates only the proposed application of LO/MIT 1 to the roof, thus, only the top floor is used in computer simulations of annual energy use.

HVAC is provided to this building similarly to that of the Visitors Quarters described above. Rooms are fitted with individual, thermostatically controlled fan-coil units.

Insulation projects evaluated for this building include:

• Apply a coating of LO/MIT-1 to roof exterior surface.

#### **Building 56301 Communications Equipment Facility**

Building 56301 is a communications equipment facility. The 30,000 square foot, single floor, building heating, ventilating and air conditioning (HVAC) system is comprised of three rooftop-mounted multi-zone air handling units. Each unit is fitted with both hot and chilled water coils. Hot water is supplied by a hot water boiler and chilled water is provided by an air cooled reciprocating chiller.

Insulation projects evaluated for this building include:

• Apply a coating of LO/MIT-1 to roof exterior surface.

#### Building 91114 Aircraft Hangar, Shops and Offices

The Aircraft hangar is constructed on a concrete slab. The central portion of the building is occupied by the high-bay hangar. The hangar is flanked on each side by two-floor office/shop wings. Construction consists of CMU walls with structural steel framing. Wall panels on the exterior office/shop wings have about a 2-inch thick layer of fiberglass insulation which has deteriorated. Roof construction is built-up roofing over a thin layer of rigid insulation. The upper floors of the office/shop wings have suspended ceilings.

The hangar is heated by natural gas fired radiant heaters and is not cooled. Office/shop wings are heated with a combination of fan-coil units fitted with steam heating coils and by steam convectors. Cooling is provided to selected areas of the two-floor office/shop wings by evaporative coolers. The Avionics shop located on the second floor of the East office/shop wing is cooled by a package rooftop air conditioner.

Insulation projects evaluated for this building include:

- Retrofit wall Insulation to achieve an insulating value of R-11,
   to be accomplished by installing rigid fiberglass board insulation between furring strips on interior walls, with new gypsum board covering, prime and finish coatings.
- Retrofit roof Insulation to achieve an insulating value of R-30,
   to be accomplished by adding rigid insulation boards to roof surface when reroofing is required.
- Apply a coating of LO/MIT-1 to roof exterior surface.

# Summary of Building Envelope Retrofit Evaluations

	Sign		1.78	1.51	2.66	2.10	21.99	2.22	3.45
	Payback	(Years)	7.32	8.65	4.81	7.13	0.56	5.23	3.72
	Investment	(\$)	\$24,210	\$4,147	\$58,567	\$16,822	\$6,437	\$1,498	\$111,681
vings	CC	Savings (\$)	\$43,080	\$6,245	\$155,623	\$35,364	\$141,556	\$3,321	\$385,191
gy Cost Sa	ric Gas L	(\$/Year)	\$1,556	\$226	\$4,318	\$3,264	\$1,994	(\$57)	\$11,301
Ener	Electric	(\$/Year)	\$1,750	\$253	\$7,857	(\$06\$)	\$9,426	\$343	\$18,724
Energy Savings	Gas (Million	BTU/Yr)	442	64	1,228	928	267	(16)	3,214
Energy :	Electric	(kWH/Year)	27,827	4,029	124,909	(14,401)	149,852	5,460	297,676
trofit	Wall	Insul	•	•			•		•
tion Re	Lo-E Roof Wall	Roof Insul Insul	•	•	•		1	•	•
Insula	Lo-E	Roof	•	•	•	•	•	•	•
Building Insulation Retrofit	Number		15544	20200	43083	51005	56301	91114	Totals

Note that only those insulation projects are listed above for which Life Cycle Cost Analyses resulted in an SIR above 1.0. Insulation retrofits recommended for each building are indicated by "." symbols, above.

				յ, N=15	cl Taxes:	յ, N=15			Cooling DD/Year	2,098	1,595	0.760									
	tors		arges:	ent Worth	ervice, in	ent Worth		ë:	Coolin					9	<u> </u>	8.52	Ved	12.58	2.10	21.99	2.22
	Energy Costs and Adjustment Factors		ng demand ch	12.02 Uniform Present Worth, N=15	Conditioning S	14.17 Uniform Present Worth, N=15		uca Energy Us	Heating DD/Year	2,678	2,551	0.953		<b>LCCA</b>	Saved (\$)	\$23,403	to energy is sa	\$80,938	\$35,364	\$141,556	\$3,321
	ts and Ac		s, includir	12.02	40 for Air	14.17		ort Huach	Heat	as				Invest-	ment (\$)	\$2,747	because <u>r</u>	\$6,433	\$16,822	\$6,437	\$1,498
	Energy Cos		Electric Usage Cost & Taxes, including demand charges:	\$0.0629 per kWH	Natural Gas Cost, Rate CG-40 for Air Conditioning Service, incl Taxes:	\$3.5163 per Mil BTU's		Adjustment for Tuscon vs. Fort Huachuca Energy Use:		Simulations @ El Paso, Texas	Actual Site Fort Huachuca	Factors:	(a)(	Gas Saved Constr. Cost Invest-	(\$)	\$2,452	Not Evaluated because no energy is saved	\$5,744	\$15,020	\$5,747	\$1,337
			Electric Usa	\$0.0629	Natural Gas	\$3.5163		Adjustment	Location	Simulations	Actual Site F	Adjustment Factors:	ies (See abo	<b>Gas Saved</b>	(\$/Year)	\$552	(\$38)	\$1,490	\$3,264	\$1,994	(\$\$1)
	LO/MIT-1	Coating SF	12,800	3,130	29,982	78,400	30,000	6,979					Adjusted Values (See above)	Elec Saved	(\$/Year)	\$1,296	<b>%</b>	\$4,977	(\$06\$)	\$9,426	\$343
	SF Roof	Insulation	12,800	3,130	29,982	sidered	sidered	6,979						Savings	Therms/Yr	1,570	(109)	4,238	9,283	5,672	(162)
	SF Wall	Insulation	7,680	1,193	32,546	Not Con	Not Con	6,466					Only	Savings	kWH/Year	20,608	0	79,124	(14,401)	149,852	5,460
	Gas	Therms/Yr Insulation	9636	411	66,982	960'29	32,087	9,596					HVAC Energy Use with Low-E Roof Coating Only	Gas	Therms/Yr kWH/Year	7,988	468	62,533	57,351	26,133	9,766
gy Use		kWH/Year	340,893	5,509	778,117	1,069,343	415,473	163,200					ith Low-E R	Electric	kWH/Year	313,786	5,509	674,041	1,088,286	218,364	156,018
VAC Ener	Building	(SF)	12,800	1,565	89,946	78,400	30,000	21,758					gy Use wi	Building	(SF)	12,800	1,565	89,946	78,400	30,000	21,758
Baseline HVAC Energy Use	<b>Building Building</b>	Number	15544	20200	43083	51005	56301	91114					HVAC Ener	<b>Building Building</b>	Number	15544	20200	43083	51005	56301	91114

HVAC En	rgy Use w	ith Added F	Roof Insulation	on Only		Adjusted Valu	ies (See abo	(e)			
Building	Building	Building Building Electric Gas	Gas	Savings Sa	vings	Elec Saved	<b>Gas Saved</b>	Elec Saved Gas Saved Constr. Cost In	Invest-	<b>LCCA</b>	
Number	er (SF) K	kWH/Year	Therms/Yr	kWH/Year	erms/Yr	(\$/Year)	(\$/Year)	(\$)	ment (\$)	Saved (\$)	SIR
15544	12,800	322,156 7,268	7,268	14,245	,256	968\$	\$793	\$10,676	\$11,957	\$22,009	1.84
20200	1,565	2,859	74	4,029	642	\$253	\$226	\$3,703	\$4,147	\$6,245	1.51
43083	89,946	627,107	54,947	114,805	1,464	\$7,221	\$4,031	\$46,548	\$52,134	\$143,921	2.76
91114	21,758	158,508	9,318	3,567	265	\$224	\$93	\$7,712	\$8,638	\$4,016	0.46

		SIR	1.45	1.08	0.81	0.47			SIR	2.66			SIR	1.78				SIR	0.65	gether,
	<b>LCCA</b>	Saved (\$)	\$13,809	\$1,277	\$114,659 0	\$13,204 0		CCCA	Saved (\$)	\$155,623 2		<b>LCCA</b>	Saved (\$)	\$43,080		•	LCCA	Saved (\$)	\$3,446 0	Note: Analysis shows that while roof and wall insulation retrofits are economically justified when evaluated separately, that when evaluated together,
	Invest-	ment (\$)	905'6\$	\$1,180	\$142,055	\$28,223	~	Invest-	ment (\$)	\$58,567	~	Invest-	ment (\$)	\$24,210		7	Invest-	ment (\$)	\$5,327	ely, that wh
(e)	Gas Saved Constr. Cost	(\$)	\$8,488	\$1,053	\$126,835	\$25,199	Adjusted Values (See above)	Gas Saved Constr. Cost	(\$)	\$52,292	Adjusted Values (See above)	Gas Saved Constr. Cost	(\$)	\$21,616	Adiusted Welles (See above)	24000 2001 20	Gas Saved Constr. Cost	(\$)	\$4,756	lluated separat
Adjusted Values (See above)	Gas Saved	(\$/Year)	\$540	\$62	\$3,451	\$333	Adjusted Valu	Gas Saved	(\$/Year)	\$4,318	Adjusted Valu	Gas Saved	(\$/Year)	\$1,556	Adinetod Valu	חום א המזכחות	Gas Saved	(\$/Year)	\$121	stified when evaluate
Adjusted Valu	Elec Saved	(\$/Year)	\$512	\$34	\$5,471	\$706		Elec Saved	(\$/Year)	\$7,857		Elec Saved	(\$/Year)	\$1,750			Elec Saved	(\$/Year)	\$144	nomically justi
	Savings	Therms/Yr	1,536	175	9,813	947	n and Low-E Roof Coating Only	Savings	Therms/Yr	12,280	HVAC Energy Use with Added Wall & Roof Insulation and Low-E Roof Coating	Savings	Therms/Yr	4,424			Savings	Therms/Yr	345	etrofits are ecor
on Only	Savings	kWH/Year	8,145	534	86,981	11,224	on and Low	Savings	kWH/Year	124,909	nsulation ar	Savings	kWH/Year	27,827	nembation	II Salation	Savings	kWH/Year	2,282	nsulation retr
HVAC Energy Use with Added Wall Insulation Only	Gas	Therms/Yr	8,024	319	56,680	8,602	<b>HVAC Energy Use with Added Roof Insulation</b>	Gas	kWH/Year Therms/Yr kWH/Year	54,091	Vall & Roof I	Gas	Therms/Yr	4,992	UVAC Engrav II so with Added Wall & Boof Institution	Vall & NOOL	Gas	Therms/Yr	48	while roof and wall i
ith Added V	Electric	kWH/Year	330,180	5,158	663,705	148,436	ith Added R	Electric	kWH/Year	613,816	ith Added V	Electric	kWH/Year	304,291	ith Added V	ייון שממכת ב	Electric	kWH/Year	2,508	that while ro
rav Use w	Building	(SF)	12,800	1,565	89,946	21,758	rgy Use w	Building	(SF)	89,946	rgy Use w	Building	(SF)	12,800	way Heav	W 250 4 FI	<b>Building Building</b>	(SF)	1,565	lysis shows
HVAC Ene	<b>Building Building</b>	Number	15544	20200	43083	91114	<b>HVAC Ene</b>	Building	Number	43083	HVAC Ene	<b>Building Building</b>	Number	15544			Building	Number	20200	Note: Anal

they are not economically justified. Recommend roof insulation only because it has the higher SIR.

CONSTRUCTION COST ESTIMATE				Date Prepai Januar		Sheet C	Of 6
Project ECIP Facility Energy Improvements				Project No.	Basis for E	stimate	
Location Fort Huachuca, Arizona					Code A	(no design c	ompeted)
Engineer-Architect							
Keller & Gannon							
Drawing No. Building 15544 Insulation Retrofits		Estima	tor BIF	I	Checked B	RCL	
	Quant	ity	Labor &	Equipment	Ma	aterial	
Line Item	No.	Unit	Per		Per		Total
Marilla Indian Dia 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Units	Meas.	Unit	Total	Unit	Total	Cost
Wall Insulation: Blow-In Insulation to Achieve R							
(Costs based on April 1994 Insulation project by DEH, Fort Hu	achuca)		,	,	,	,	T
Blow-In Wall Insulation, drilling & patching, fiberglass to R-11	7,680	SF	\$0.74	\$5,683	\$0.05	\$384	\$6,067
Subtotal				\$5,683		\$384	\$6,067
Arizona Transaction Privilege Tax	3.75%	%		-		\$14	\$14
Subtotal							\$6,082
Contractor OH & Profit	25.0%	%					\$1,520
Subtotal							\$7,602
Bond	1.5%	%	ļ				\$114
f				<u> </u>			\$7,716
Subtotal	l						
Subtotal Estimating Contingency	10.0%	%					\$772
Estimating Contingency Total Probable Construction Cost							\$772 \$8,488
Estimating Contingency			hieve	R-30			<del>1</del>
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hu	f Roof achuca a	to Ad	Means	1994)			\$8,488
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of	f Roof	to Ac			\$0.47	\$6,016	<del>1</del>
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hu Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal	f Roof achuca a	to Ad	Means	1994)	\$0.47	\$6,016 \$6,016	\$8,488
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hu Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax	f Roof achuca a	nd on	Means	1994) \$1,408	\$0.47	<del></del>	\$8,488 \$7,424
Estimating Contingency Total Probable Construction Cost  Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Huller Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal  Arizona Transaction Privilege Tax Subtotal	f Roof achuca a 12,800	nd on SF	Means	1994) \$1,408	\$0.47	\$6,016	\$7,424 \$7,424 \$226 \$7,650
Estimating Contingency Total Probable Construction Cost  Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hulfiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal  Arizona Transaction Privilege Tax Subtotal  Contractor OH & Profit	f Roof tachuca a	nd on SF	Means	1994) \$1,408	\$0.47	\$6,016	\$7,424 \$7,424 \$226 \$7,650 \$1,912
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Huller Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal	12,800 3.75%	to Ad nd on SF %	Means	1994) \$1,408	\$0.47	\$6,016	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hule Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond	f Roof achuca a 12,800	nd on SF	Means	1994) \$1,408	\$0.47	\$6,016	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143
Estimating Contingency Total Probable Construction Cost  Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Huller Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal  Arizona Transaction Privilege Tax Subtotal  Contractor OH & Profit Subtotal  Bond Subtotal	3.75% 25.0%	%	Means	1994) \$1,408	\$0.47	\$6,016	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705
Estimating Contingency Total Probable Construction Cost  Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hulfiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal  Arizona Transaction Privilege Tax Subtotal  Contractor OH & Profit Subtotal  Bond Subtotal  Estimating Contingency	12,800 3.75%	%	Means	1994) \$1,408	\$0.47	\$6,016	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971
Estimating Contingency Total Probable Construction Cost  Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hulfiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal  Arizona Transaction Privilege Tax Subtotal  Contractor OH & Profit Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost	3.75% 25.0% 10.0%	%	Means \$0.11	\$1,408 \$1,408 -		\$6,016	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705
Estimating Contingency Total Probable Construction Cost  Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hull Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal  Arizona Transaction Privilege Tax Subtotal  Contractor OH & Profit Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top of Roof (Co	3.75% 25.0% 10.0%	% % %	Means \$0.11	\$1,408 \$1,408 - -	ge, 25%	\$6,016 \$226	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hule Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs	3.75% 25.0% 1.5% 10.0% ests based for spray	% % % gainti	Means \$0.11 00 SF/G	1994) \$1,408 \$1,408 - - al coveragested for the	ge, 25% e location	\$6,016	\$8,488 \$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676
Estimating Contingency Total Probable Construction Cost  Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hulfberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal  Arizona Transaction Privilege Tax Subtotal  Contractor OH & Profit Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs  Apply LO/MIT 1 Coating to Roof Surface	3.75% 25.0% 10.0%	% % % gainti	Means \$0.11	\$1,408 \$1,408 	ge, 25%	\$6,016 \$226	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hull Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs Apply LO/MIT 1 Coating to Roof Surface Subtotal	12,800 3,75% 25.0% 1.5% 10.0% sts based for spray	% % % SF % Show the second on 6 painting SF	Means \$0.11 00 SF/G	1994) \$1,408 \$1,408 - - al coveragested for the	ge, 25% e location	\$6,016 \$226 1.) \$800 \$800	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hu Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax	3.75% 25.0% 1.5% 10.0% ests based for spray	% % % SF % Show the second on 6 painting SF	Means \$0.11 00 SF/G	\$1,408 \$1,408 	ge, 25% e location	\$6,016 \$226	\$8,488 \$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676 \$1,434 \$1,434 \$30
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hu Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal	12,800 3.75% 25.0% 1.5% 10.0% psts based for spray 12,800 3.75%	% % % gainti	Means \$0.11 00 SF/G	\$1,408 \$1,408 	ge, 25% e location	\$6,016 \$226 1.) \$800 \$800	\$8,488 \$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676 \$1,434 \$1,434 \$30 \$1,464
Estimating Contingency Total Probable Construction Cost  Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hulfiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal  Arizona Transaction Privilege Tax Subtotal  Contractor OH & Profit Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs  Apply LO/MIT 1 Coating to Roof Surface Subtotal  Arizona Transaction Privilege Tax Subtotal  Contractor OH & Profit	12,800 3,75% 25.0% 1.5% 10.0% sts based for spray	% % % gainti	Means \$0.11 00 SF/G	\$1,408 \$1,408 	ge, 25% e location	\$6,016 \$226 1.) \$800 \$800	\$8,488 \$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676 \$1,434 \$1,434 \$3,00 \$1,464 \$366
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hull Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal	12,800 3.75% 25.0% 1.5% 10.0% sts based for spray 12,800 3.75%	% % % % % % % % % % % % % % % % % % %	Means \$0.11 00 SF/G	\$1,408 \$1,408 	ge, 25% e location	\$6,016 \$226 1.) \$800 \$800	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676 \$1,434 \$1,434 \$30 \$1,464 \$366 \$1,830
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hur Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond	12,800 3.75% 25.0% 1.5% 10.0% psts based for spray 12,800 3.75%	% % % % % % % % % % % % % % % % % % %	Means \$0.11 00 SF/G	\$1,408 \$1,408 	ge, 25% e location	\$6,016 \$226 1.) \$800 \$800	\$8,488 \$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676 \$1,434 \$1,434 \$30 \$1,464 \$366 \$1,830 \$27
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hule Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal	12,800 3.75% 25.0% 1.5% 10.0% 12,800 3.75% 25.0% 1.5%	% % % % % % % % % % % % % % %	Means \$0.11 00 SF/G	\$1,408 \$1,408 	ge, 25% e location	\$6,016 \$226 1.) \$800 \$800	\$8,488 \$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676 \$1,434 \$1,434 \$1,434 \$30 \$1,464 \$366 \$1,830 \$27 \$1,858
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hule Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency	12,800 3.75% 25.0% 1.5% 10.0% sts based for spray 12,800 3.75%	% % % % % % % % % % % % % % % % % % %	Means \$0.11 00 SF/G	\$1,408 \$1,408 	ge, 25% e location	\$6,016 \$226 1.) \$800 \$800	\$8,488 \$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676 \$1,434 \$1,434 \$30 \$1,464 \$366 \$1,830 \$27 \$1,858 \$186
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hulfiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost	12,800 3.75% 25.0% 1.5% 10.0% 12,800 3.75% 25.0% 1.5%	% % % % % % % % % % % % % % %	Means \$0.11 00 SF/G	\$1,408 \$1,408 	ge, 25% e location	\$6,016 \$226 1.) \$800 \$800	\$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676 \$1,434 \$1,434 \$30 \$1,464 \$366 \$1,830 \$27 \$1,858 \$186 \$2,044
Estimating Contingency Total Probable Construction Cost Roof Insulation: Fiberglass Batts to Underside of (Costs based on April 1994 Insulation project by DEH, Fort Hule Fiberglass Batt Insulation, R-30 Batts above drop-ceiling Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top of Roof (Cocontractor discount from \$50/Gal and Means 1994 labor costs Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency	12,800 3.75% 25.0% 1.5% 10.0% 12,800 3.75% 25.0% 1.5%	% % % % % % % % % % % % % % % % %	Means \$0.11 00 SF/G	\$1,408 \$1,408 	ge, 25% e location	\$6,016 \$226 1.) \$800 \$800	\$8,488 \$7,424 \$7,424 \$226 \$7,650 \$1,912 \$9,562 \$143 \$9,705 \$971 \$10,676 \$1,434 \$1,434 \$30 \$1,464 \$366 \$1,830 \$27 \$1,858 \$186

				Date Prepar	ed ed	Sheet (	Of
CONSTRUCTION COST	ESTI	MAT	E	Januar	y 1995	2	6
Project				Project No.	Basis for E	stimate	
ECIP Facility Energy Improv	ements						
Location Fort Huachuca	, Arizon	а			Code A	(no design c	ompeted)
Engineer-Architect Keller & Gannon							
Drawing No.		Estima	tor		Checked B	Ву	
Building 20200 Insulation Retr	ofits	l	BIF	1		RCL	
	Quan	tity	L	abor	Ma	aterial	
Line Item	No.	Unit	Per		Per		Total
	Units	Meas.	Unit	Total	Unit	Total	Cost
Wall Insulation: Blow-in Insulat	ion to A	Achie	ve R-1	1			
(Costs are based on April 1994 Insulation	n Project	by DE	H, Fort	Huachuca	, assume:	s 1/2 mate	rial cost
& 2/3 installation cost due to settling of e	-	-					
Blow-In Wall Insulation, drilling &	1,193	SF	\$0.61	\$724	\$0.025	\$30	\$753
patching, fiberglass to R-11	1,700					<u> </u>	ļ
Subtotal				\$724	<del>  </del>	\$30	\$753
Arizona Transaction Privilege Tax	3.75%	%			<u> </u>	\$1	\$1
Subtotal							\$755
Contractor OH & Profit	25.0%	%					\$189
Subtotal		ļ					\$943
Bond	1.5%	%					\$14
Subtotal	ļ	ļ					\$957
Estimating Contingency	10.0%	%					\$96
Total Probable Construction Cost		<u> </u>		<u> </u>	L	<u> </u>	\$1,053
Roof Insulation: Fiberglass Bat (Costs based on April 1994 Insulation pro- work is performed when re-roofing is req Fiberglass Batt Insulation, R-30 Batts	ject by C	EH, F	ort Hua	chuca and	on Mean	ıs 1994, as	sumes
above drop-ceiling	3,130	SF	\$0.11	\$344	\$0.47	\$1,471	\$1,815
Remove existing deteriorated fiberglass batt insulation during reroofing	3,130	SF	\$0.25	\$783	\$0.00	\$0	\$783
Subtotal		<u> </u>		\$1,127		\$1,471	\$2,598
Arizona Transaction Privilege Tax	3.75%	%				\$55	\$55
Subtotal							\$2,653
Contractor OH & Profit	25.0%	%					\$663
Subtotal							\$3,316
Bond	1.5%	%					\$50
Subtotal							\$3,366
Estimating Contingency	10.0%	%					\$337
Total Probable Construction Cost							\$3,703

				Date Prepa	red	Sheet O	
CONSTRUCTION COST	ESTIM/	ATE			y 1995	3	6
					•		
Project FOLD Famility Family				Project No.	Basis for E	stimate	
ECIP Facility Energy Improve	ments			<u> </u>			
Location Fort Huachuca,	Arizona				Code A	(no design co	ompeted)
Engineer-Architect					1		
Keller & Gannon					İ		
Drawing No.		Estima	ator		Checked E	Ву	
Building 43083 Insulation Retro	ofits		BIH	ł		RCL	
	Quan	tity	L	abor	M	aterial	
Line Item	No.	Unit	Per		Per		Total
	Units	Meas.	1	Total	Unit	Total	Cost
Wall Insulation: Interior Rigid Fil	perglass	Boa	rd & N	lew Surf	ace to	Achieve I	R-11
(Costs based on Means 1994, adjusted for							
Rigid Fiberglass Board for R-11	32,546		\$0.20	\$6,406	\$1.50	\$48,975	\$55,381
Furring Strips 1"x2", 16" O.C.	24,410		\$0.32	\$7,780	\$0.16	\$3,801	\$11,581
Gypsum Board, Taped & Finished, 1/2"	32,546	SF	\$0.34	\$10,943	\$0.19	\$6,158	\$17,100
Paint, Spray, Base plus Finish Coats	32,546	SF	\$0.08	\$2,688	\$0.06	\$1,851	\$4,539
Subtotal	<b></b>	ļ		\$27,816	ļ	\$60,785	\$88,601
Arizona Transaction Privilege Tax	3.75%	%		-	ļ	\$2,279	\$2,279
Subtotal							\$90,881
Contractor OH & Profit	25.0%	%					\$22,720
Subtotal	ļ		ļ			<u> </u>	\$113,601
Bond	1.5%	%					\$1,704
Subtotal							\$115,305
Estimating Contingency	10.0%	%					\$11,530
Total Probable Construction Cost		<u></u>					\$126,835
Roof Insulation: Rigid Board Ins							
(Costs based on Means 1994, adjusted for	Fort Huacl	nuca's	location	, performe	d as part	or reroofing	)
Rigid Polyisocyanurate 2#/CF, 3-1/2" R-25	29,982	SF	\$0.14	\$4,275	\$0.93	\$28,027	\$32,302
Subtotal				\$4,275		\$28,027	\$32,302
Arizona Transaction Privilege Tax	3.75%	%		-		\$1,051	\$1,051
Subtotal	ļ						\$33,353
Contractor OH & Profit	25.0%	%					\$8,338
Subtotal							\$41,691
Bond	1.5%	%					\$625
Subtotal							\$42,316
Estimating Contingency	10.0%	%					\$4,232
Total Probable Construction Cost							\$46,548
LO/MIT 1 Roof Coating: Apply to	Top of	Root	(Costs	based on 6	600 SF/G	al coverage	
contractor discount from \$50/Gal and Mean	=					_	
Apply LO/MIT 1 Coating to Roof Surface	29,982	SF	\$0.05	\$1,486	\$0.06	\$1,874	\$3,359
Subtotal				\$1,486		\$1,874	\$3,359
Arizona Transaction Privilege Tax	3.75%	%		-		\$70	\$70
Subtotal Contractor OH & Profit	25.00/	0/	<del>                                     </del>				\$3,430
Subtotal	25.0%	%	-	ļ			\$857 \$4,287
Bond	1.5%	%	<u> </u>				\$64
Subtotal	1	<u> </u>	<del> </del>				\$4,352
Estimating Contingency	10.0%	%					\$435
Total Probable Construction Cost							\$4,787
Subtotal	10.000						\$5,222
Estimating Contingency Total Probable Construction Cost	10.0%	%	<del> </del>				\$522 \$5.744
Total Frondoie Collettuction Cust	1		<u> </u>	I	L	I	\$5,744

				Date Prepai	red	Sheet C	)f
CONSTRUCTION COS	ST ESTIN	TAN	E	Januar	y 1995	4	6
Project				Project No.	Basis for I	Estimate	*****
ECIP Facility Energy Impro	ovements				_		
Location					Code A	(no design o	ompeted)
Fort Huachuc	a, Arizon	а					
Engineer-Architect Keller & Gannon							
Drawing No.		Estima	tor		Checked 8	<del></del> Ву	
Building 51005 Insulation Re	etrofits		BIF	l		RCL	
	Quant	ity		abor	M	aterial	
Line Item	No.	Unit	Per		Per		Total
	Units	Meas.	Unit	Total	Unit	Total	Cost
	0	I WICAS.	l Olik	, otal	l Our	l i Otal	į Cost
LO/MIT 1 Roof Coating: Apply					1		1
	to Top	of Ro	of (Cos	ts based	on 600 S	F/Gal cove	erage, 25%
LO/MIT 1 Roof Coating: Apply contractor discount from \$50/Gal and Mapply LO/MIT 1 Coating to Roof Surface	to Top	of Ro	of (Cos	ts based	on 600 S	F/Gal cove	erage, 25%
contractor discount from \$50/Gal and N Apply LO/MIT 1 Coating to Roof	to Top o	of Ro	of (Cos	ts based or spray pa	on 600 S ainting, a	F/Gal cove	erage, 25% the locat
contractor discount from \$50/Gal and N Apply LO/MIT 1 Coating to Roof Surface	to Top o	of Ro	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900	the locat \$8,785
contractor discount from \$50/Gal and N Apply LO/MIT 1 Coating to Roof Surface Subtotal	78,400	of Ro	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900 \$4,900	\$8,785 \$8,785 \$184
contractor discount from \$50/Gal and M Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax	78,400	of Ro	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900 \$4,900	\$8,785 \$8,785 \$184 \$8,969
contractor discount from \$50/Gal and Mapply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal	78,400 3.75%	SF %	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900 \$4,900	\$8,785 \$1,84 \$8,969 \$2,242
contractor discount from \$50/Gal and Mapply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal	78,400 3.75%	SF %	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900 \$4,900	\$8,785 \$8,785 \$184 \$8,969 \$2,242 \$11,211
contractor discount from \$50/Gal and Mapply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal	78,400 3.75%	SF %	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900 \$4,900	\$8,785 \$8,785 \$184 \$8,969 \$2,242 \$11,211
contractor discount from \$50/Gal and Mapply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal	78,400 3.75%	SF %	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900 \$4,900	\$8,785 \$8,785 \$184 \$8,969 \$2,242 \$11,211 \$168
contractor discount from \$50/Gal and Mapply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal	78,400 3.75% 25.0%	SF %	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900 \$4,900	\$8,785 \$8,785 \$8,785 \$184 \$8,969 \$2,242 \$11,211 \$168 \$11,379 \$1,138
contractor discount from \$50/Gal and Mapply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency	78,400 3.75% 25.0%	SF %	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900 \$4,900	the locat \$8,785
contractor discount from \$50/Gal and Mapply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost	78,400 3.75% 25.0%	SF %	of (Cos	ts based or spray pa \$3,885	on 600 S ainting, a	F/Gal cove djusted for \$4,900 \$4,900	\$8,785 \$8,785 \$184 \$8,969 \$2,242 \$11,211 \$168 \$11,379 \$1,138

· O T II 4 4			· '		Sheet Of	f
:STIMP	\IE		Januar	y 1995	5	6
nents			Project No.	Basis for B	Estimate	
	a			Code A	(no design co	ompeted)
ting	Estima		Н	Checked I	<sup>3y</sup> RCL	
Quan	tity		Labor	N	laterial	
No.	Unit	Per		Per		Total
Units	Meas.	Unit	Total	Unit	Total	Cost
		\$0.05	\$1,487	\$0.06	\$1,875	\$3,362
			\$1,487		\$1,875	\$3,362
3.75%	%		-		\$70	\$70
						\$3,432
25.0%	%					\$858
						\$4,290
1.5%	%					\$64
						\$4,354
10.0%	%					\$435
			-	ļ		\$4,790
10.00/	0/					\$5,225
10.0%	70					\$522 \$5,747
	Arizona  ting Quant No. Units  Top of s 1994 la 30,000  3.75% 25.0%	Estimating	Estimator ting BII Quantity No. Unit Per Units Meas. Unit Top of Roof (Costs ts 1994 labor costs for s 30,000 SF \$0.05  3.75% %  25.0% %  1.5% %  10.0% %	Estimator ting  Estimator No. Unit Per Units Meas. Unit Total  Top of Roof (Costs based on 60 s 1994 labor costs for spray paintin 30,000 SF \$0.05 \$1,487  3.75% %  1.5% %  10.0% %	Project No. Basis for R  Code A  Arizona  Estimator BIH  Quantity Labor No. Unit Per Units Meas. Unit Total Unit Top of Roof (Costs based on 600 SF/Gals 1994 labor costs for spray painting, adjusted 30,000 SF \$0.05 \$1,487 \$0.06  \$1,487  3.75% %  1.5% %  10.0% %	Froject No.  Project No.  Basis for Estimate  Code A (no design of String)  BIH  Quantity  Labor  No.  Unit  Per  Units  Meas.  Unit  Total  Top of Roof (Costs based on 600 SF/Gal coverage, s 1994 labor costs for spray painting, adjusted for the lot 30,000 SF \$0.05 \$1,487 \$0.06 \$1,875  3.75% %  1.5% %  10.0% %  10.0% %

				Date Prepa	red	Sheet C	Of .
CONSTRUCTION COST ESTIN	MATE			Januar		6	6
Project				Project No.	Basis for	Estimate	
ECIP Facility Energy Improvements					j		
Location Fort Huachuca, Ariz	zona				Code A	(no design	competed)
Engineer-Architect					1		
Keller & Gannon							
Drawing No.		Estima	itor		Checked	Ву	
Building 91114 Insulation Retrofits			BIH	ł		RCL	
	Quant	ity	L	abor	M	aterial	
Line Item	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	Total Cost
Wall Insulation: Interior Rigid Fiberglas			<del></del>			L	Cost
(Costs based on Means 1994, adjusted for Fort Hu				unidoc i	Aom	. 10 11-11	
Rigid Fiberglass Board for R-11	6,466	SF	\$0.20	\$1,273	\$1.50	\$9,730	\$11,003
Furring Strips 1"x2", 16" O.C.	4,850	LF	\$0.32	\$1,546	\$0.16	\$755	\$2,301
Gypsum Board, Taped & Finished, 1/2"	6,466	SF	\$0.34	\$2,174	\$0.19	\$1,223	\$3,397
Paint, Spray, Base plus Finish Coats	6,466	SF	\$0.08	\$534	\$0.06	\$368	\$902
Subtotal	5,.55	<u> </u>	V	\$5,526	40.00	\$12,076	\$17,603
Arizona Transaction Privilege Tax	3.75%	%		-		\$453	\$453
Subtotal	0.1070	-70				4100	\$18,055
Contractor OH & Profit	25.0%	%		<del>                                     </del>	<b></b>		\$4,514
Subtotal							\$22,569
Bond	1.5%	%					\$339
Subtotal							\$22,908
Estimating Contingency	10.0%	%					\$2,291
Total Probable Construction Cost							\$25,199
Roof Insulation: Rigid Board Insulation	to Roc	of Su	rface t	o Achie	ve R-3	<del>o</del>	
(Costs based on Means 1994, adjusted for Fort Hu	ıachuca's	locati	on, perf	ormed as	part or re	eroofing)	
Rigid Polyisocyanurate 2#/CF, 2-1/2" R-17	6,979	SF	\$0.09	\$656	\$0.67	\$4,694	\$5,350
Subtotal				\$656		\$4,694	\$5,350
Arizona Transaction Privilege Tax	3.75%	%		_			
Subtotal		<u> </u>				\$176	\$176
						\$176	\$5,526
Contractor OH & Profit	25.0%	%				\$176	<del></del>
Subtotal						\$176	\$5,526
Subtotal Bond	25.0% 1.5%					\$176	\$5,526 \$1,382 \$6,908 \$104
Subtotal Bond Subtotal	1.5%	%				\$176	\$5,526 \$1,382 \$6,908 \$104 \$7,011
Subtotal Bond Subtotal Estimating Contingency		%				\$176	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$701
Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost	1.5%	% %					\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$701 \$7,712
Subtotal  Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top o	1.5% 10.0% <b>f Roof</b> (	% % (Costs				erage, 25%	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$701 \$7,712
Subtotal  Bond Subtotal  Estimating Contingency  Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994	1.5% 10.0% of Roof (	% % (Costs	spray pa	ainting, adj	usted fo	erage, 25% r the location	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$701 \$7,712 6
Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994 Apply LO/MIT 1 Coating to Roof Surface	1.5% 10.0% <b>f Roof</b> (	% % (Costs		ainting, ad \$346		erage, 25% r the location \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$701 \$7,712 6 on.) \$782
Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994  Apply LO/MIT 1 Coating to Roof Surface Subtotal	1.5% 10.0% <b>f Roof</b> ( labor cos 6,979	% % (Costs sts for SF	spray pa	ainting, adj	usted fo	erage, 25% r the location \$436 \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$7,712 6 on.) \$782 \$782
Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994 Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax	1.5% 10.0% of Roof (	% % (Costs	spray pa	ainting, ad \$346	usted fo	erage, 25% r the location \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$7,712 6 on.) \$782 \$782 \$16
Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994 Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal	1.5% 10.0% If Roof (labor cos 6,979 3.75%	% % (Costs sts for SF	spray pa	ainting, ad \$346	usted fo	erage, 25% r the location \$436 \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$7,712 6 on.) \$782 \$16 \$798
Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994 Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax	1.5% 10.0% <b>f Roof</b> ( labor cos 6,979	% % (Costs sts for SF	spray pa	ainting, ad \$346	usted fo	erage, 25% r the location \$436 \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$7,712 6 on.) \$782 \$782 \$16
Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994 Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond	1.5% 10.0% If Roof (labor cos 6,979 3.75%	% % (Costs sts for SF	spray pa	ainting, ad \$346	usted fo	erage, 25% r the location \$436 \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$7,712 6 on.) \$782 \$16 \$798 \$200
Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994 Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal	1.5% 10.0% f Roof (labor cos 6,979 3.75% 25.0%	% % (Costs sts for SF %	spray pa	ainting, ad \$346	usted fo	erage, 25% r the location \$436 \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$7,712 6 on.) \$782 \$16 \$798 \$200 \$998 \$15 \$1,013
Subtotal  Bond Subtotal Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994 Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency	1.5% 10.0% If Roof (labor cos 6,979 3.75%	%  % (Costs sts for SF  %	spray pa	ainting, ad \$346	usted fo	erage, 25% r the location \$436 \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$7,712 6 on.) \$782 \$16 \$798 \$200 \$998 \$15 \$1,013 \$101
Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994 Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost	1.5% 10.0% f Roof (labor cos 6,979 3.75% 25.0%	% % (Costs sts for SF %	spray pa	ainting, ad \$346	usted fo	erage, 25% r the location \$436 \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$7,712 6 on.) \$782 \$16 \$798 \$200 \$998 \$15 \$1,013 \$1,114
Subtotal  Bond Subtotal  Estimating Contingency Total Probable Construction Cost  LO/MIT 1 Roof Coating: Apply to Top o contractor discount from \$50/Gal and Means 1994 Apply LO/MIT 1 Coating to Roof Surface Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency	1.5% 10.0% f Roof (labor cos 6,979 3.75% 25.0%	% % (Costs sts for SF %	spray pa	ainting, ad \$346	usted fo	erage, 25% r the location \$436 \$436	\$5,526 \$1,382 \$6,908 \$104 \$7,011 \$7,712 6 on.) \$782 \$16 \$798 \$200 \$998 \$15 \$1,013 \$101

Location: Project Title: Discrete Portio	Fort Huachuca, ECIP Facility Endon: Building 15544:	ergy Improvemen		Project No. Fiscal Year Preparer: KELL	FY96 ER & GANNON
	Roof Coating  Banuary 1995		Economic Life: 15		
-	•				
1. Investmen	· · · · · · · · · · · · · · · · · · ·		<del> </del>		
A. Construct	ion Costs		\$21,616		
B. SIOH			\$1,297		
C. Design Co	st		\$1,297		
D. Total Cost	t (1A + 1B + 1C)		\$24,210		
E. Salvage Va	alue of Existing Ed	quipment		\$0	•
F. Public Utili	ity Company Reba	ite		\$0	_
Investment (1	D-1E-1F)				\$24,210
2. Energy Sa	vings (+)/Cost(-):				
			tors: October 1994	4	
Energy	Cost	Saving	Annual \$	Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)
Source	\$/WB10	WIB10/11(2)	Savings(S)	Tactor(4)	Savings(S)
A. Elec.	\$18.43	95.0	\$1,750	12.02	\$21,039
B. Dist		0	<b>\$</b> 0		<b>\$</b> 0
C. LPG		0	<b>\$</b> 0		<b>\$</b> 0
D. Natural Ga	as \$3.52	442.4	\$1,556	14.17	\$22,042
E. Demand S			<b>\$</b> 0	12.02	<b>\$</b> 0
F. Total		537.3	\$3,306		\$43,081
3. Non Energ	y Savings (+) or	Cost (-):			
A. Americal De			40		
A. Annual Re	=		\$0	10.74	
- •	Factor (Table A)	34 241)		10.74	60
(2) Discounte	ed Savings/Cost (3	3A X 3A1)			<b>\$</b> 0
B. Non Recur	rring Savings (+)	or Cost (-)			
Item	Savings(+)	Year of	Discount	Discounted Sa	av-
	Cost(-)(1)	Occur. (2)	Factor(3)	ings(+)Cost(-	
a.		0000 (2)	. 4000 (0)		7 7
b.					
C.					
d. Total					
u. Total					
C Total Non	Energy Discounte	d Savings (3A2+	3Bd4)	\$0	
4. First Year	Dollar Savings (2)	F3 + 3A + (3Bd	1/Years Economic I	_i \$3,306	
	yback (1G/4):			7.32	Years
· ·	Discounted Savin	gs (2F5 + 3C):		\$43,081	
	Investment Ratio	=		1.78	
-					

Project Title:	Fort Huachuca, <i>A</i> ECIP Facility Ene Building <b>20200</b> : January 1995	rgy Improvement	Region No. 4 ts Economic Life: 15	Preparer: KELLI	Y96 ER & GANNON
1. Investment C	Costs				
A. Construction			\$3,703		
B. SIOH	00010		\$222		
C. Design Cost			\$222		
D. Total Cost (1	A + 1B + 1C)		\$4,147		
	e of Existing Equ	inment	44,147	\$O	
=	Company Rebate	•		\$0	<del>-</del>
G. Total Investr	· ·				- \$4,147
					•
2. Energy Savin	gs (+)/Cost(-):				
Date of NISTIR	85-3273 Used fo	or Discount Facto	ors: October 1994		
Energy	Cost	Saving	Annual \$	Discount	Discounted
Source	\$/MBTU	-			
Source	\$/IVID1U	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)
A. Elec.	\$18.43	13.8	\$253	12.02	\$3,046
B. Dist		0	<b>\$</b> 0		<b>\$</b> 0
C. LPG		0	<b>\$</b> 0		\$O
D. Naturai Gas	\$3.52	64.2	\$226	14.17	\$3,199
E. Demand Save	ed Included abo	ve	kW \$0	12.02	\$0
F. Total		78.0	\$479		\$6,245
3. Non Energy S	Savings (+) or Co	ost (-):			
A. Annual Recu	rring ( + /-)		<b>\$</b> 0		
(1) Discount Fac	_			10.74	
	Savings/Cost (3A	A x 3A1)		10.74	<b>\$</b> 0
(2) Discounted	Savings/Cost (or	( X 5A 1)			ΨO
B. Non Recurrin	g Savings (+) or	Cost (-)			
Item	Savings(+)	Year of	Discount	Discounted Sav	/-
	Cost(-)(1)	Occur. (2)	Factor(3)	ings( + )Cost(-)(	4)
a.	<del></del>				
b.					
с.	***************************************		er = 00 00000		
d. Total					
C Total Non Ene	ergy Discounted	Savings (3A2 + 3	3Bd4)	<b>\$</b> 0	
4 First Voor Do	illar Savinas 1253	2 ± 2A + /2D-41	Noore Economic Life	\ 6470	
	=	> + 3A + (3B01	/Years Economic Life)		Voorn
5. Simple Payba		(255 · 20)		8.65	Years
	scounted Savings			\$6,245	
/. Savings to In	vestment Ratio (	SIR) 6/1G:		1.51	

Fort Huachuca, Arizona Location: Region No. 4 Project No. Project Title: **ECIP Facility Energy Improvements** Fiscal Year FY96 Discrete Portion: Building 43083: Roof Insulation and Low-E Roof Coat Preparer: KELLER & GANNON Analysis Date: January 1995 Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$52,292 B. SIOH \$3,138 C. Design Cost \$3,138 D. Total Cost (1A + 1B + 1C) \$58,567 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$0 G. Total Investment (1D-1E-1F) \$58,567 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Energy Cost Saving Annual \$ Discount Discounted Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. 426 \$18.43 \$7,857 12.02 \$94,439 **B.** Dist 0 \$0 \$0 C. LPG 0 \$0 \$0 D. Natural Gas 1,228 \$3.52 \$4,318 14.17 \$61,185 E. Demand Saved Included above 12.02 kW \$0 \$0 F. Total 1,654 \$12,175 \$155,623 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) \$0 (1) Discount Factor (Table A) 10.74 (2) Discounted Savings/Cost (3A x 3A1) \$0 B. Non Recurring Savings (+) or Cost (-) Item Savings(+) Year of Discount Discounted Sav-Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4)a. b. c. d. Total C Total Non Energy Discounted Savings (3A2 + 3Bd4) \$0 4. First Year Dollar Savings (2F3 + 3A + (3Bd1/Years Economic Life)) \$12,175 5. Simple Payback (1G/4): 4.81 Years 6. Total Net Discounted Savings (2F5 + 3C): \$155,623 7. Savings to Investment Ratio (SIR) 6/1G: 2.66

		Arizona rgy Improvements Low-E Roof Coat	Region No. 4  Economic Life: 15	Preparer: KELLI	Y96 ER & GANNON
1. Investment	Costs				
A. Constructio	n Costs		\$15,020		
B. SIOH			\$901		
C. Design Cost	t		\$901		
D. Total Cost (	1A + 1B + 1C)		\$16,822		
	ue of Existing Equ	-		<u> </u>	_
-	Company Rebate	9		<u>\$0</u>	<del>-</del>
G. Total Invest	ment (1D-1E-1F)				\$16,822
2. Energy Savi	ngs (+)/Cost(-):				
		or Discount Factor	s: October 1994		
Energy	Cost	Saving	Annual \$	Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)
000.00	*/////510	W.B.1 07 11(2)	ouvings, or	1 40101(47	0441193(07
A. Elec.	\$18.43	(49.2)	(\$906)	12.02	(\$10,888)
B. Dist		0.0	<b>\$</b> 0		<b>\$0</b>
C. LPG		0.0	<b>\$</b> 0		<b>\$0</b>
D. Natural Gas	\$3.52	928.3	\$3,264	14.17	\$46,253
E. Demand Sav	ved Included abo	ve k'	W\$0	12.02	<b>\$0</b>
F. Total		879.1	\$2,358		\$35,364
3 Non Energy	Savings (+) or Co	net (-)·			
or Horr Enorgy	0011190 (17 01 01	55( ).			
A. Annual Rec	urring (+/-)		<u> </u>		
(1) Discount Fa	actor (Table A)			10.74	
(2) Discounted	Savings/Cost (3A	A x 3A1)			\$0
B. Non Recurri	ng Savings (+) or	Cost (-)			
lana	Savinnat . )	Vacant	Diagonat	Discounted Co.	
Item	Savings(+)	Year of	Discount	Discounted Sav	-
•	Cost(-)(1)	Occur. (2)	Factor(3)	ings(+)Cost(-)(	4)
a. b.					
C.					
d. Total					
C Total Non Er	nergy Discounted	Savings (3A2 + 3B	d4)	\$0	
4. First Year D	ollar Savings (2F3	B + 3A + (3Bd1/\	/ears Economic Life)	) \$2,358	
5. Simple Payl	. <del>-</del>	·		7.13	Years
	iscounted Savings	(2F5 + 3C):		\$35,364	
7. Savings to	Investment Ratio	(SIR) 6/1G:		2.10	

Project Title:	Fort Huachuca, A ECIP Facility Ene Building 91114: January 1995	rgy Improvemen		Preparer: KELI	FY96 LER & GANNON
1. Investment (	Costs				
A. Construction			\$5,747		
B. SIOH	. 00313		\$345		
C. Design Cost			\$345		
D. Total Cost (	1 A ± 1R ± 1C)		\$6,437		
	e of Existing Equ	inment	VU, <del>T</del> 37	<b>\$</b> 0	
	Company Rebate			\$0	
	ment (1D-1E-1F)	•			— \$6,437
G. Total investi	none (10-12-11)				VU,437
2. Energy Savir		or Discount Fact	ors: October 1994		
Energy	Cost	Saving	Annual \$	Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)
A. Elec.	610.42	E44 A	40.420	12.02	4442.207
B. Dist	\$18.43	511.4	\$9,426 \$0	12.02	\$113,297
<del>-</del>		0.0	\$0 \$0		\$O
C. LPG	62.52	0.0	\$0 \$1.004	14 17	\$0 \$38.350
D. Natural Gas	\$3.52 ed Included abo	567.2	\$1,994 kW \$0	14.17	\$28,260 \$0
E. Demand Sav	eu included abo	ve	kW <u>\$0</u>	12.02	\$0
F T-4-1		4 070 6	444 400		A444 EEA
F. Total		1,078.6	\$11,420		\$141,556
	Savings (+) or Co		\$11,420		\$141,556
	Savings (+) or Co		\$11,420		\$141,556
3. Non Energy			11 01 TA, (11 <b>4 40 7</b>		\$141,556
3. Non Energy S	ırring (+/-)		\$11,420 \$0	10.74	\$141,556
3. Non Energy :  A. Annual Recu (1) Discount Fa	rring (+/-) ctor (Table A)	ost (-):	11 01 TA, (11 <b>4 40 7</b>	10.74	
3. Non Energy :  A. Annual Recu (1) Discount Fa	ırring (+/-)	ost (-):	11 01 TA, (11 <b>4 40 7</b>	10.74	\$141,556 \$0
3. Non Energy S  A. Annual Recu (1) Discount Fa (2) Discounted	irring (+/-) ctor (Table A) Savings/Cost (3A	ost (-):	11 01 TA, (11 <b>4 40 7</b>	10.74	
3. Non Energy S  A. Annual Recu (1) Discount Fa (2) Discounted	rring (+/-) ctor (Table A)	ost (-):	11 01 TA, (11 <b>4 40 7</b>	10.74	
3. Non Energy S  A. Annual Recu (1) Discount Fa (2) Discounted	urring (+/-) ctor (Table A) Savings/Cost (3A ng Savings (+) or	ost (-):	11 01 TA, (11 <b>4 40 7</b>	10.74	<b>\$</b> 0
Non Energy:     A. Annual Recu     (1) Discount Fa     (2) Discounted     B. Non Recurring	irring (+/-) ctor (Table A) Savings/Cost (3A	ost (-): ( × 3A1) Cost (-)	\$0 Discount	Discounted Sa	\$O av-
Non Energy:     A. Annual Recu     (1) Discount Fa     (2) Discounted     B. Non Recurring	urring (+/-) ctor (Table A) Savings/Cost (3A ng Savings (+) or Savings(+)	ost (-): ( x 3A1) Cost (-) Year of	\$O		\$O av-
3. Non Energy:  A. Annual Recu (1) Discount Fa (2) Discounted  B. Non Recurring  Item	urring (+/-) ctor (Table A) Savings/Cost (3A ng Savings (+) or Savings(+)	ost (-): ( x 3A1) Cost (-) Year of	\$0 Discount	Discounted Sa	\$O av-
3. Non Energy:  A. Annual Recu (1) Discount Fa (2) Discounted  B. Non Recurring Item  a.	urring (+/-) ctor (Table A) Savings/Cost (3A ng Savings (+) or Savings(+)	ost (-): ( x 3A1) Cost (-) Year of	\$0 Discount	Discounted Sa	\$O av-
3. Non Energy:  A. Annual Recu (1) Discount Fa (2) Discounted  B. Non Recurrin  Item  a. b. c.	urring (+/-) ctor (Table A) Savings/Cost (3A ng Savings (+) or Savings(+)	ost (-): ( x 3A1) Cost (-) Year of	\$0 Discount	Discounted Sa	\$O av-
3. Non Energy:  A. Annual Recu (1) Discount Fa (2) Discounted  B. Non Recurrin  Item  a. b.	urring (+/-) ctor (Table A) Savings/Cost (3A ng Savings (+) or Savings(+)	ost (-): ( x 3A1) Cost (-) Year of	\$0 Discount	Discounted Sa	\$O av-
3. Non Energy:  A. Annual Recu (1) Discount Fa (2) Discounted  B. Non Recurring Item  a. b. c. d. Total	urring (+/-) ctor (Table A) Savings/Cost (3A ng Savings (+) or Savings(+)	Cost (-):  Year of Occur. (2)	\$0  Discount Factor(3)	Discounted Sa	\$O av-
3. Non Energy:  A. Annual Recu (1) Discount Fa (2) Discounted  B. Non Recurrin  Item  a. b. c. d. Total  C Total Non En	erring (+/-) ctor (Table A) Savings/Cost (3A) ag Savings (+) or Savings(+) Cost(-)(1)	Ost (-):  Cost (-)  Year of Occur. (2)  Savings (3A2+3)	\$0  Discount Factor(3)	Discounted Saings(+)Cost(-	\$O av-
3. Non Energy:  A. Annual Recu (1) Discount Fa (2) Discounted  B. Non Recurrin  Item  a. b. c. d. Total  C Total Non En  4. First Year Do	erring (+/-) ctor (Table A) Savings/Cost (3A) ng Savings (+) or Savings(+) Cost(-)(1) ergy Discounted 3	Ost (-):  Cost (-)  Year of Occur. (2)  Savings (3A2+3)	\$0  Discount Factor(3)	Discounted Saings(+)Cost(-	\$0 av- )(4)
3. Non Energy:  A. Annual Recu (1) Discount Fa (2) Discounted  B. Non Recurrin  Item  a. b. c. d. Total  C Total Non En  4. First Year Do 5. Simple Payb	erring (+/-) ctor (Table A) Savings/Cost (3A) ag Savings (+) or Savings(+) Cost(-)(1) ergy Discounted Sollar Savings (2F3) ack (1G/4):	Savings (3A2 + 3A + (3Bd1	\$0  Discount Factor(3)	\$0 \$11,420 0.56	\$O av-
3. Non Energy:  A. Annual Recu (1) Discount Fa (2) Discounted  B. Non Recurrin  Item  a. b. c. d. Total  C Total Non En  4. First Year Do 5. Simple Payb 6. Total Net Dis	erring (+/-) ctor (Table A) Savings/Cost (3A) ng Savings (+) or Savings(+) Cost(-)(1) ergy Discounted 3	Savings (3A2 + 3Bd1)	\$0  Discount Factor(3)	Discounted Saings(+)Cost(-	\$0 av- )(4)

Location: Fort Huachuca, Arizona Region No. 4 Project No. **Project Title: ECIP Facility Energy Improvements** Fiscal Year **FY96** Discrete Portion: Building 91114: Low-E Roof Coat Preparer: KELLER & GANNON Analysis Date: January 1995 Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$1,337 B. SIOH \$80 C. Design Cost \$80 D. Total Cost (1A + 1B + 1C) \$1,498 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$0 G. Total Investment (1D-1E-1F) \$1,498 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Energy Discount Discounted Saving Annual \$ Cost Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. 18.6 \$343 \$4,128 \$18.43 12.02 **B.** Dist 0.0 \$0 \$0 C. LPG 0.0 \$0 \$0 D. Natural Gas \$3.52 (16.2)(\$57)14.17 (\$807)E. Demand Saved Included above kW 12.02 \$0 \$0 F. Total 2.4 \$286 \$3,321 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) \$0 (1) Discount Factor (Table A) 10.74 (2) Discounted Savings/Cost (3A x 3A1) \$0 B. Non Recurring Savings (+) or Cost (-) Item Savings(+) Year of Discount Discounted Sav-Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4)a. b. c. d. Total C Total Non Energy Discounted Savings (3A2 + 3Bd4) \$0 4. First Year Dollar Savings (2F3 + 3A + (3Bd1/Years Economic Life)) \$286 5. Simple Payback (1G/4): 5.23 Years 6. Total Net Discounted Savings (2F5 + 3C): \$3,321 7. Savings to Investment Ratio (SIR) 6/1G: 2.22

Region No. 4 Location: Fort Huachuca, Arizona Project No. Project Title: **ECIP Facility Energy Improvements** Fiscal Year FY96 Discrete Portion: Total Project Preparer: KELLER & GANNON Analysis Date: January 1995 Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$99,715 B. SIOH \$5,983 C. Design Cost \$5,983 D. Total Cost (1A + 1B + 1C) \$111,681 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$0 G. Total Investment (1D-1E-1F) \$111,681 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Discount Energy Cost Saving Annual \$ Discounted Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. \$18.43 1,016.0 \$18,724 12.02 \$225,060 B. Dist 0.0 \$0 \$0 C. LPG 0.0 \$0 \$0 D. Natural Gas \$3.52 3,213.8 \$11,301 14.17 \$160,131 E. Demand Saved Included above kW \$0 12.02 \$0 F. Total 4,229.8 \$30,025 \$385,191 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) \$0 (1) Discount Factor (Table A) 10.74 (2) Discounted Savings/Cost (3A x 3A1) \$0 B. Non Recurring Savings (+) or Cost (-) Year of **Discount** Discounted Sav-Item Savings(+) Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4)a. b. c. d. Total C Total Non Energy Discounted Savings (3A2 + 3Bd4) \$0 4. First Year Dollar Savings (2F3 + 3A + (3Bd1/Years Economic Life)) \$30,025 5. Simple Payback (1G/4): 3.72 Years 6. Total Net Discounted Savings (2F5 + 3C): \$385,191 7. Savings to Investment Ratio (SIR) 6/1G: 3.45



# RADIANT BARRIER COATING

# For Energy Conservation and Light Reflection

LO/MIT-I is a silver colored, non-thickness dependent, low emissivity coating. Its superb ability to reflect both heat (Infrared radiation) and light make it an excellent, low cost substitute for metallic foils or metallized plastic films. High temperature tolerance, excellent adhesion and the ability to produce uniformly low emissivities on a wide variety of substrates make LO/MIT-I unique in the field of high technology coatings.

#### OPTICAL CHARACTERISTICS

Laboratory application of LO/MIT-I on glass substrates has lowered emissivity from .86 to .22 and increased spectral reflectivity from 7.3% to 85%. LO/MIT-I can be applied to a wide variety of substrates and normally will create a surface emissivity of .21-.26, and a spectral reflectivity of 81%-85%, depending on the substrate used. The chart on the rear of this bulletin shows optical properties on specific materials.

#### CONSTITUENTS

Aromatic hydrocarbons, aliphatic ketones, proprietary pigments and binders.

#### SOLVENT

Solsolv 301 or xylene.

#### VISCOSITY

29 seconds #1 Zahn's cup.

#### **HARDNESS**

Extremely strong 3H hardness after 24 hour room temperature cure. Hardness increases with age.

#### **DEGRADATION & OUTGASSING**

Unaffected by UV or elevated temperatures. Thermally tolerant to 1000° F (538°C). No outgassing when correctly cured.

#### COVERAGE

400-800 square feet/gallon, depending on surface and application method.

Clean application equipment with Solsolv 301 or Xylene. Use Isopropyl Alcohol for operator clean up and removal from clothing.

Coating supplied ready for use. No thinning is required or suggested. Shake well before using. If possible, agitate during apolication.

#### SURFACE PREPARATION

Normally, adhesion is the only factor that will be affected by surface preparation. Optical properties will remain constant except on surfaces that are very porous such as brick and cement. To improve optical properties on porous substrates, appropriate fillers and primers may be used to increase surface smoothness. This will also increase coverage. On metallic substrates, such as cold rolled or galvanized steel, that may be subject to possible corrosion or oxidation, appropriate primers should be used before applying LO/MIT-I. Where a surface is already primed or painted, apply a test patch of LO/MIT-I to ascertain that the prepared surface is compatible with the solvents used in LO/MIT-I. Plastics may require surface treatment to increase adhesion and should be tested for compatibility with LO/MIT-I. Most building materials, such as wood, plasterboard, paper faced insulation batts, fibrous ceiling tiles and painted metal roof decking require no surface preparation except that they be clean and dust free. Masonry surfaces should be allowed to cure for one month prior to the application of LO/MIT-I.

Any surface preparation questions not answered in this section should be referred to our Technical Services Department.

#### APPLICATION

ออลสนใกล้ย การกรก

Air Atomization: Use DeVilbiss pressure gun #JGA-502-704-FX; gun pressure of 30 psi (2.11 kg/cm²); tank pressure of 4-6 psi (.14-.42 kg/cm²). Remote paint supply pots should be equipped with an air driven agitator to keep coating thoroughly mixed during application.-OR-DeVilbiss suction gun #JGA-502-43-FF, gun pressure of 25 psi (1.76 kg/cm²). Needle adjustment = 1/2 open. Hold spray gun 8-14" from work. Spraying at the lower pressure (25-30 psi) indicated will lessen overspray and effect better coverage. Use 2 horsepower or larger compressor.

Airless and Electrostatic: Test airless and electrostatic equipment for compatability with LO/MIT-I before using. Remote paint supply pots should be equipped with an air driven agitator to keep coating thoroughly mixed during application.

Portable Compression Sprayer: The SOLEC Model LS-1 portable compression sprayer is a low cost, self-contained coating application device for the field application of LO/MIT-I to roof decks, cinder block walls, attics, or new construction where power is unavailable. Ask for Bulletin LS-1.

Brush and Roller: LO/MIT-I may also be applied using a solvent resistant paintbrush or roller. However, coverage may be substantially reduced.

Note: Good ventilation is necessary for operator safety and drying and curing of the applied coating.

#### DRYING AND CURE

Coating will skin dry within one minute after application. Drying to touch will generally occur within 15 minutes to one hour depending on ambient temperature and humidity. Curing can be accelerated by application of heat up to 500°F (260°C) for 4 to 30 minutes. Experimentation will determine the best curing procedures for your particular environment.

#### STORAGE

Keep at room temperature in tightly sealed container. Keep out of direct sunlight to avoid pressure increase in container. Full containers will remain usable for 1 year from date of manufacture.

Contains flammable solvents. Do not expose to elevated heat or open flames. Use with adequate ventilation and avoid excessive breathing of vapor or spray mist. Avoid contact with eyes. OSHA regulations, Sections 1915.24-Painting, 1915.25—Flammable Liquids and 1915.82—Respiratory Protection give additional helpful safety suggestions.

#### FIRST AID

Remove from skin using isopropyl alcohol and warm soapy water. In case of contact with eyes, flush with clean water for at least 15 minutes and get medical attention. If swallowed, get immediate medical attention. If headache, dizziness or nausea result from excessive inhalation of vapors, remove to fresh air and administer oxygen if necessary.

SOLAR ENERGY CORPORATION, BOX 3065, PRINCETON, NJ 08543-3065, U.S.A.

#### PACKAGING

Steel containers. Quarts, gallons, 5 gallon tight head pails. Weights including containers: Quart (.95 liters) = 2.5 lbs. (1.13 kilos), Gallons (3.79 liters) = 8.2 lbs. (4.24 kilos), 5 gallons (18.93 liters) = 42.5 lbs. (21.66 kilos).

#### ORDERING AND PRICING INFORMATION

Contact factory at 609-883-7700 for name of your local distributor, pricing and availability. F.O.B. Ewing, N.J. Shipping and packaging extra. Available for export.

Terms: Net 30 days for D&B rated firms.

#### U.S. GOVERNMENT PURCHASERS:

LO/MIT-I is available through GSA: Contract #TFTC-88-CK-NIIS-01 effective 7/1/89-Section Heading: 80 Brushes, Paint, Sealers & Adhesives. GSA, Proc. Div. (9FTP10-C-M) GSA Center, Auburn, WA 98001.

#### TECHNICAL SERVICES DEPARTMENT

Contact factory at 609-883-7700, 9-5 pm, EST

or fax 609-497-0182, 24 hours a day.

#### ACCESSORIES & ADDITIONAL PRODUCTS

LS-1, Modified Compression Sprayer, a low cost, self-contained, coating application device.

SOLKOTE HI/SORB-II, spray applied selective coating.

SOLKLEAN 101, Production metal cleaner.

SOLKLEAN 201, Water based aluminum conversion coating. SOLSOLV 301, Low cost replacement solvent for Xylene. ISOPROPYL ALCOHOL, For clean-up of LO/MIT-I coatings.

risk and liability whatsoever in connection therewith. No statement or recommendation shall have any force or effect

chantability.

IMPORTANT NOTICE TO PURCHASER

unless in an agreement signed by officers of seller and user. **RESEARCH FACILITIES** The Solar Energy Corporation maintains a complete laboratory for the analysis of optical coatings. Our low cost services for the analysis of optical surfaces are used by many large manufacturers. Please contact us for prices.

This bulletin is an introductory summary of LO/MIT-I Radiant Barrier

Coating. The information provided is based upon typical installation

conditions and tests we believe to be reliable. However, due to a wide

variety of possible use conditions, SOLEC does not guarantee that typical values expressed will necessarily be obtained. The following

is made in lieu of warranties, expressed or implied, including mer-

Seller's only obligation shall be to replace such quantity of the product proved to be defective. Seller shall not be liable for any injury,

loss or damage, direct or consequential, arising out of the use of or

inability to use the product. Before using, user shall determine the

suitability of the product for their intended use, and user assumes all

LO/MIT/NOTES

The Solar Energy Corporation maintains a continuing research program in spray applied optical surfaces. Pertinent data is published in the form of builetins called LO/MIT/NOTES. These bulletins are available, free to our customers and other interested parties. Please write us to have your name placed on our mailing list.

#### OPTICAL PROPERTIES OF SELECTED SUBSTRATES

Substrate	Emissivity Before LO/MIT Applied	Emissivity After LO/MIT Applied	Diffuse Reflectivity Before LO/MiT Applied	Diffuse Reflectivity After LO/MIT Applied 71%
brick (red clay) cement block glass (soda lime) galvanized steel (bright) galvanized steel (dull paint lock) paper (kraft) plasterboard plywood poly carbonate (clear) polypropylene (opaque) steel, cold rolled, primed steel, cold rolled, unprimed steel, 316 stainless	.92 .93 .86 .03 .57 .80 .90 .72 .84 .90 .87 .10	.22 .23	48 55 46	85 84 82 81 85 81 84 84 84 84

#### LO/MIT-I Application ideas-

LO/MIT-I is extremely lightweight (less than .05 oz./ft²). It may be effectively used as a heat shield on many aircraft components including wiring harnesses, cowlings, fire walls and electronic components. It is also an excellent coating for balloon fabrics.

LO/MIT-I may be used as a low cost, lightweight heat shield on many automotive components including wiring harnesses, battery boxes, exhaust systems, air conditioning ducts, fire walls, intake manifolds, fuel pumps, rubber hoses, shock absorber boots, floor pans, electronic and plastic components.

Building and Construction
LO/MIT-I is a low cost substitute for metallic or metallized plastic foils. Wherever these products are used for energy conservation in new or retrofit construction, spray application of LO/MIT-I will generally prove to be as effective at half the cost. In many instances, where it may be impractical to staple or tack reflective radiant barriers, LO/MIT-I may be easily spray applied.

Since LO/MIT-I exhibits a high diffuse reflectivity on many building materials, it may be effectively used to enhance daylighting and lower illumination costs.

The use of LO/MIT-I on ceiling and wall surfaces can result in substantial heating and cooling energy savings. (See Radiant Barriers, Building and Construction, Metal Buildings.) Also, in factory buildings and ware-houses, the application of LO/MIT-I to interior ceiling surfaces may raise winter radiant temperatures and increase ceiling reflectivity, thereby lowering both heating and lighting costs.

#### **Metal Buildings**

LO/MIT-I, when applied to the exterior of metal buildings, has been shown to lessen building skin temperatures in excess of 30°F (16°C) in 95°F (35°C) ambient environments. This can lead to substantial decreases in heating and air conditioning costs.

Ovens. Process Piping, Power Generation Equipment LO/MIT-I when applied to the exterior surfaces of boilers, ovens or high temperature process piping can effectively block thermal radiation and may lead to substantial efficiency increases.

#### Plastics'

Whenever plastics are subjected to elevated temperatures, surface apwhenever plastics are subjected to devated temperatures, but and lower plication of LO/MIT-I may lessen degradation due to adverse thermal environments. In many cases, lower cost and lower weight plastics may be used when they are coated with LO/MIT-I.

#### Radiant Barriers

Recent tests by the Florida Solar Energy Center (FSEC) indicate that the role of radiant heat transfer, particularly in hot, sunny climates, may be much more important than recently recognized. In these climates, be much more important than recently recognized. In these children heat gain prevention is often more critical to the energy performance of a building than stopping heat loss. Application of LO/MIT-I to the undersides of roofs and cavity wall surfaces creates an extremely effective to the contract of tive radiant barrier that may lead to substantial energy savings at lower installed per square foot costs than aluminum foil or metallized plastic

#### Reflectors - 9:555

LO/MIT-I exhibits excellent diffuse reflectivity on many substrates. It may be used as a low cost reflective surface in lighting fixtures, control panels and many other applications where reflectivity is needed.

Roof Coating
LO/MIT-I will lower roof skin temperatures 20-40°F. It is unaffected by LO/MiT-I will lower root skin temperatures 20-40°F. It is unaffected by UV radiation and highly reflective to infrared. It will greatly extend roof life and may be brushed, rolled or spray applied to bitumen, PVC. rubber, asphalt, tar and gravel, foam, shingle, tile, steel and most other roofing surfaces. It is hydrophobic and tends to be self-cleaning. Field testing in Southern climates has shown energy savings from 15% to in excess of 30% when LO/MIT-I is used as a reflective roof coating.

#### Selective Surfaces

High emissivity surfaces such as glass or cement, when coated with LO/MIT-I, exhibit low emissivities of .22-.30. By overcoating the LO/MIT-I surface with SOLKOTE Hi/Sorb-II spray applied selective coating, a semi-selective surface exhibiting emissivities of .42-.50 and absorptivities of 95 to 97% may be achieved. At an installed cost of 12 to 17 cents per square foot, substantial cost savings can be achieved over the use of selective metal foils.

**EEAP Energy Savings Opportunity Survey** Fort Huachuca, Arizona Work Request 2 Gas Engine-Driven Chiller Retrofit F:\PROJ\1640313\WORD\WORKREQ.COV 950210

WORK REQUEST (IFS-M)
(For use of this form, see AR 420-17 and DA PAM 420-6; the proponent agency is USACE.)

	MER	DOCUMENT	^	30									3	, .	Nottalaossa aoi taons	2	Š												DATE	11.5	
PART A (See Instructions)	CODE	SEKIAL NUMBER	Ь	Ж									Ž	ב ב		7537	ַ ק	<u> </u>	_								ă		MON	-	۲R
	FEE		2	Д	ပ	G A	S	쁴	Z	9	ENGINE	Э		R	DRIVEN	<b>^</b>	E	<u>_</u>	HЭ	딝	111	旦	ER	~		-		_		$\dashv$	_
INSTALLATION										2	BUILDING / FACILITY NUMBERS	3/F	ACIL F	Ĕ	N	BER	တ္က			Í								-			
FACILITIES	1 2			3				4			2				ဖ				7				80			6				10	
1 H U A	6 3 0 1			$\vdash \!$	$\vdash \vdash$		$\vdash \vdash$	$\vdash \vdash$	$\Box$		4		+	$\vdash \vdash$						$\vdash \vdash$	$\vdash \vdash$	$\Box$	十	$\vdash \vdash$		$\vdash$		$\vdash$			
3 2				+	+		+	+	$\perp$	土	+		+	+			╁	$\bot$		╁	+		士	+		+		+		+	+
REMARKS: This Work Requ	This Work Request is a result of the EEAP, ESOS	EEAP,	ES	S		] 을	ted	ğ	죨	<u>=</u>	conducted by Keller & Gannon under Contract No. DACA05-C-92-0155.	[ ]	=	퉏	ပြ	녍	ğ	Įė	ă	돵	15	-92	둫	55		뒅	<b>Economic analysis</b>	ag	Sis	1	-
results are: \$13,290 energy cost saved less \$ 1,032 added O&M costs per year for an investment of \$122,512; SIR = 1.06; Payback Period = 9.99 years.	y cost saved less \$	1,032 ac	dde	Õ	Z	COS	ts p	ě	/ear	for	an	nve	stm	ent	of	122	2,51	2; \$	<u>~</u>	: 1.t	96;	Pay	pac	k Pe	riod	6 = 1	.99	/ear	S.		
INSTALLATION NAME:				ರ	STC	CUSTOMER NAME	¥.	Æ								₹	8	POC NAME					$\vdash$		8	S S	POC PHONE NUMBER	Ž	ABER		
FORT HUACHUCA, ARIZONA	AN AN	Directorate of Engineering and Housing W I L L I A M	rate	ō	E	ine	Prin I	gal	힏	취	sing	3	ᆖ	-	Ξ	۲	×	7		S	Ш	STEIN		6 0 2	2	5	5 3 3	3 -	1 8		6 1
WORK DESCRIPTION (Description of work requested): Refer to the attacl	n of work requested): Rel	fer to th	le a	tac	hed	ij	Ę	atio	ă f	ž	hed information for details and specifics concerning the analyses.	san	s p	bec	įįį:	00 5	nce	Ë	ig t	le a	nal	/se:	S.								
Replace the existing 80 Ton, electrically driven, air cooled chi	n, electrically driven	, air co	oled	다	<u>ller</u>	¥it	ha.	gas	euč	gine	ller with a gas engine driven chiller to reduce energy costs to cool the building.	/en	chi	<u>er</u>	5	npa	Se e	ner	gyc	Sost	ts tc	8	<u>\$</u>	d ar	uidi i	ng.					
The replacement chiller shall be the following, or an approved	all be the following,	or an a	ppr	Svec		ednal:																									
ENCHILL Model ECA 70 G:	_	Refrige	gant	<b>.</b> .		75	뎔	S nc	Ĭ	al c	72 Tons nominal capacity	Ě				œ	T	鱼	87 HP Engine	ē											
	1.21 HP/Ton	Ē			7	7	The	E	ਮ੍ਰੀ	ur g	7.21 Therms/Hour gas consumption	JUST	Ē	tion		1.2	0	1.21 C.O.P	٠.												
Installation of this replacement chiller will reduce electric demand and usage charges while incurring additional natural gas costs under a reduced price rate schedule for natural gas fired cooling systems.	ment chiller will redu red cooling systems	ce elect	tric	der	nan	d ar	ם ק	Isag	<u>o</u>	harç	Jes 1	Åhil	e ii	cur	ring	ad	iž.	onal	nat	ura	l ga	S C	osts	nu	era	red	nce	d b	ice	ate	
									,	'																					
	AUTHORIZED REQUESTOR (Type or Print)	or Print)																		SKG	SIGNATURE	Ę						1			
PART B	APPROVAL ACTION CODE:	CODE:								<u> </u>	SPECIAL INTEREST CODE:	AL II	AE.	ZES.	8	Ä							H	H			DA	Н	DATE	Н	YR
(Approving Official Only)	WORK REQUEST PRIORITY: PROGRAM INDICATOR CODE:	IORITY:					$\dashv$	$\vdash \mid$		<u></u> u	ESTIMATED WORK START DATE: ESTIMATED WORK COMPI FTION DATE:	IATE	3 3	Š Š	ST/S	NRT (	ATF.	iii Z	Ė.												$\blacksquare$
TO A COMPLETE LA TIME DATE OF THE PARTY OF T		-				_	$\parallel$	$\neg$			<u> </u>			5	3	<u> </u>	<u> </u>	<u> </u>	ن			L					]	-   \$	┨,	-	$\prod$
⋛		:		į	1							į	;	;		í							Γ	į		2	SOURCE OF FUNDS	Š S	'n		
YES NO ENVIRONMENTAL	PERFORMED	<u></u>	VOR	WORKCLASS	SS			_	N.	FINDED	-	PRC	XAL XAL	Ā	APPROVAL AMOUNTS		Ä	CHUNITANI	<u>.</u>				_	DIRECT	ST MAT	<u> </u>	DIRECT ALITOMATIC REIMBLIRSEMENT	a c	N L	F	
CONSIDERATION	IN-HOUSE				•	<u> </u>	H	H			-		₩7	44			$\exists$	}		H					ED R	EIME	FUNDED REIMBURSEMENT	EME	Ę	-	
INITIATED	SELF-HELP CONTRACT				es es		+	+		士	+		J, <b>V</b> )	. s			+	_	$\perp$	+				l°	置	Ę	OTHER FUND CITATION	I	8		
COMPLETED	TROOP		<b>-</b> 6	] [4			H	+	П		+	$\Box$	. •7	. <b></b>	П		+	$\coprod$		+	$\overline{}$		H	<b>`</b>				Н		Н	
DESIGN APPROVAL	ROVAL		۵	DATE		П	٣				<b>   </b>	PPR	NA NA	LAU	APPROVAL AUTHORITY	RIT					Н	APF	APPROVAL ACTION	AL A	CTIO	z	Ш		DATE		
		<u>s</u>	2	NOM.	4	χ.		١												1							Ճ	-	§ No No No No No No No No No No No No No		χ.
(Please type or print name)	int name)			$\dashv$	$\dashv$							(P)	ge fyp	e or p	(Please type or print name)	(eu							APPROVED DISAPPROV	ROV APPR	APPROVED DISAPPROVED	۵		$\dashv$		$\dashv$	$\dashv$
(Signature)	(6	_	l			$\neg$	$\dashv$	1					(3%	(Signature)	<sub>@</sub>					, [	_	]									

#### Natural Gas Cooling for CETEC Communications Equipment Facility Building 56301

Building cooling is presently provided by an air cooled reciprocating chiller serving rooftop multi-zone air handling units.

The existing electric powered chiller has a capacity of about 80 Tons and serves a design cooling load of 69 Tons; the chiller's maximum electric power demand is 67.0 kW.

The possibility of replacing the existing electric powered chiller with a natural gas powered chiller is investigated. Three types of natural gas powered chillers are available:

- Direct Fired Absorption Chillers
- Hot Water Heated Absorption Chillers
- Gas Engine-Driven Chillers

The possibility of installing an absorption chiller to be used in conjunction with the hot water output from the hot water boiler in building 56301 was investigated, and found not to be feasible. Trane, Carrier, and York absorption chillers were investigated. It was determined that the hot water output from the boiler will not attain the minimum input temperature required. The minimum input water temperature required, according to catalog information, is 240°F, whereas the maximum output temperature from the boiler is controlled at approximately 182°F.

Use of a direct fired absorption chiller was also considered. The smallest capacity offered is about 100 tons, too large for building 56301.

Gas engine driven chillers available as packaged systems from Tecochill and Enchill are considered.

#### **Existing Chiller Energy Use**

Power consumption data is not available for the building. Existing cooling energy use is calculated based on installed equipment capacity and building envelope data.

Capacities of installed air handling systems are as follows:

Unit Description	Sensible BTUH	Total BTUH
ACU/ACCU 1	48,300	56,820
AH1	240,440	253,095
AH2	248,760	261,860
AH3	240,550	253,210
Totals	778,050	824,985

Assuming capacity is selected at about 10% over the actual zone loads, the block cooling load is, thus: 907,484 BTUH, or 76 Tons.

The Cooling Load Temperature Difference for the building is found to be about 15.14 °F, based on envelope data. The annual cooling-degree-days from the Fort Huachuca Meteorological Team report dated November 30, 1992 are: 1,595 Cooling-Degree-Days per Year.

The annual cooling load is, thus estimated at 2,294 Million BTU per Year.

Based on vendor information for the existing chiller, energy use is based on: 1.4 kW/Ton; annual

power consumption is, thus:

267,690 kWH per Year.

Electric Power Demand is charged at:

\$10.65 per kW per month including applicable taxes and the

effects of Fort Huachuca's high power factor.

Electric Power use is charged at:

\$0.04835 per kWH including applicable taxes.

Annual power cost to operate the existing chiller is, thus: \$21,508 per year including demand & use charges.

#### **Proposed Gas Engine Driven Chiller Energy Use**

The proposed gas engine driven chiller is:

**ENCHILL Model ECA 70 G:** 

HCFC R-22 Refrigerant

72 Tons nominal capacity

87 HP Engine 1.21 HP/Ton

7.21 Therms/Hour gas consumption

1.21 C.O.P.

Full load operating hours, based on the above load calculations:

2,528 Hours per Year.

Fuel consumption based on chiller performance data:

1,823 Million BTU per Year

Natural Gas rate for gas engine driven systems offered by Southwest Gas Corporation under Schedule CG-35.

\$4.2758 per Million BTU. Applicable taxes per current billings add an additional 5.430% for an overall natural gas cost of \$4.5080 per Million BTU.

Annual energy cost for operating a gas engine driven chiller are:

\$8,218 per year.

#### Operating and Maintenance (O&M) Costs

Based on a recent paper appearing in Energy Engineering, Vol. 91, No. 2, 1994, by D. J. Anderson, operating costs for the existing chiller and proposed engine driven chiller are:

80 Ton Existing: \$0.0075 per Ton per Hour x 2,528 Hours = \$1,517 per Year. 72 Ton Proposed: \$0.0140 per Ton per Hour x 2,528 Hours = \$2,549 per Year.

#### **Analysis Results**

Installation costs are estimated on the next page

Life cycle cost analysis resulted in the following measures for a 15 year economic life.

Simple Payback Period: 9.99 Years

Savings to Investment Ratio (SIR): 1.06

Adjusted Internal Rate of Return (AIR 4.90%

The proposed project is marginally economically attractive and should be considered for implementation.

CONSTRUCTION COST I	ESTIM	ATE		Date Prepar Janua	<sub>еd</sub> ry 1995	Sheet C	of 1
Project ECIP Facility Energy Improve	ments			Project No.	Basis for Es	timate	
Location Fort Huachuca,	Arizona	a			Code A (n	o design cor	npeted)
Engineer-Architect							
Keller & Gannon Drawing No.		Estima	tor		Checked By		
Drawing No.		CSuma	BIH		Checked by	RCL	
	Quant	tity	La	abor	Ma	terial	
Line Item	No.	Unit	Per		Per		Total
	Units	Meas.	Unit	Total	Unit	Total	Cost
Enchill ECA 70 G 72 Ton Air Cooled Reciprocating Engine Driven Chiller	1	EA	\$2,880	\$2,880	\$60,000	\$60,000	\$62,880
Concrete Equipment Pad	7	CY	\$21.00	\$147	\$65.00	\$455	\$602
(assumed 12" thick slab)		<u> </u>	Ψ2.1.00	Ψ1-7/	Ψ00.00	Ψ+35	ΨΟυΖ
Connect to CHW Piping (8" Dia)	80	LF	\$17.60	\$1,408	\$30.00	\$2,400	\$3,808
(allowance includes fittings)  Connect to Condenser Piping (2-1/2" Dia)						. ,	', ',
(allowance includes fittings)	60	LF	\$6.40	\$384	\$15.00	\$900	\$1,284
Electrical Connections and Service	1	JOB	\$2,500	\$2,500	\$2,000	\$2,000	\$4,500
Control Systems Modifications	1	JOB		\$1,800	\$1,000	\$1,000	\$2,800
00B Φ1,000 Φ1,000 Φ1,000 Φ				<b>\$2,000</b>			
						<u> </u>	
		<b></b>					
							<u> </u>
							<u> </u>
Subtotal				\$9,119		\$66,755	\$75,874
Arizona Transaction Privilege Tax	3.75%	%		-		\$2,503	\$2,503
Subtotal	30,0	-,-				72,000	\$78,377
Contractor OH & Profit	25.0%	%					\$19,594
Subtotal							\$97,972
Bond	1.5%	%					\$1,470
Subtotal							\$99,441
Estimating Contingency	10.0%	%					\$9,944
Total Probable Construction Cost							\$109,385

Location: Fort Huachuca, Arizona Region No. 4 Project No. Project Title: ECIP Facility Energy Improvements Fiscal Year FY96 Discrete Portion: Building 56301 Gas Engine Driven Chiller Retrofit Preparer: KELLER & GANNON Analysis Date: January 1995 Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$109,385 B. SIOH \$6,563 C. Design Cost \$6,563 D. Total Cost (1A+1B+1C) \$122,512 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$0 G. Total Investment (1D-1E-1F) \$122,512 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Energy Cost Saving Annual \$ **Discount** Discounted Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. \$14.17 914 \$12,943 12.02 \$155,572 B. Dist \$13.25 0 \$0 \$0 C. LPG \$7.37 0 \$0 \$0 D. Natural Gas (1,823)14.17 \$4.51 (\$8,218) (\$116,449) E. Demand Saved \$127.84 67.0 \$8,565 12.02 \$102,955 F. Total (909)\$13,290 \$142,078 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) (\$1,032) (1) Discount Factor (Table A) 11.94 (2) Discounted Savings/Cost (3A x 3A1) (\$12,317)B. Non Recurring Savings (+) or Cost (-) Item Savings(+) Year of Discount Discounted Sav-Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4)a. b. C. d. Total C Total Non Energy Discounted Savings (3A2+3Bd4) (\$12,317)4. Simple Payback 1G/(2F3+3A+(3Bd1/Economic Life)): 9.99 Years 5. Total Net Discounted Savings (2F5+3C): \$129,761 6. Savings to Investment Ratio (SIR) 5/1G: 1.06 7. Adjusted Internal Rate of Return (AIRR): 4.9%

**EEAP Energy Savings Opportunity Survey** Fort Huachuca, Arizona Work Request 3 **Building HVAC Control Modifications And High Efficiency Motor Retrofits** F:\PROJ\1640313\WORD\WORKREQ.COV 950210

WORK REQUEST (IFS-M)
(For use of this form, see AR 420-17 and DA PAM 420-6; the proponent agency is USACE.)

	CUSTOMER	DOCUMENT												{		9		3		-											DATE			
PART A (See Instructions)	CODE	SERIAL NUMBER	<u>u</u>	ᄮ										Ę,	SHOKI JOB DESCRIPTION	ğ	2	<u>\$</u>	<u>₹</u>	z									Ą		MOM		Ϋ́R	
4	. E E		5	<u>a</u>		E	HVAC			၁	苘	ONTROL	R	0		8	Ц	Σ	. О М	r lo	OR		RE	ΞŢ	R	0	TROFI	T		-		-		
INSTALLATION											BUI	BUILDING / FACILITY NUMBERS	G/F	NG	Ę	N.	MBE	RS																
FACILITIES	1	2		က				4				5				9				7				8				6				10		
1 H O A	5 5 4 4 4 3	0 8 3	2	М	0	-	2 7	7 3	0	လ	9	1 7	0	-	9	2 7	0	4	9	9 /	0	-	8	0 5	0	2	9 1	1	-	4				
3						П	H	$\sqcup$			H	$\dashv$			H	-	$\perp$		$\vdash$	$\vdash$			H	Н	П	H	Н	П	$\Box$	Н	П	$\vdash$	$\vdash$	
REMARKS: This Work Request is a result of the EEAP, ESOS	est is a result of	the EE/	4P, E	SOS	3 C	<b>b</b> uc	uct	정타	Ϋ́	e e	er &	Ga	בבו	שור	Ind	er C	ont	rac	t D	Š	05	6-O	20	155.	Щ	ono	Tic	ang	alys	is re	conducted by Keller & Gannon under Contract DACA05-C-92-0155. Economic analysis results	S		
are: \$42,996 energy and \$4,105 O&M annual cost savings; Total Cost of \$41,877 less TEP Co. rebate of \$1,778; SIR = 2.94; Payback Period = 4.88 years.	,105 O&M annua	cost s	aving	S; I	18	اتِ	pst	<b>%</b>	Ž.	877		Ĕ	ᇜ	ပ္ပါ	힏	ate	9	£,	778	2	#	2.9	÷	ay	ack	Pe	흲	= 4	88	yea	ē.		İ	
INSTALLATION NAME:					SUS	₫	<b>CUSTOMER NAME</b>	MAM	ய									Š	POC NAME	¥							8	E H	ONE	Ž	POC PHONE NUMBER			
FORT HUACHUCA, ARIZONA	IA.	Dire	Directorate of Engineering and Housing  W     L   L   I   A   M	te o	道	.g	<u>ē</u>	ing	an	Ηp	šno	ing	M	Ξ		1	٧	М		ſ	S	1	E	S T E I N 6 0 2	9	0	2	5	3 3	3	1	8	6 1	,
WORK DESCRIPTION (Description of work requested):	of work requested):	Refe	Refer to the attached information for details and specifics concerning the analyses.	he a	Ita	che	d in	fon	mai	tion	for	del	ails	an	d s	bec	ific	SCC	) Duc	Ë	ng t	he	ana	lyse	S.									
Building 56301 HVAC Control Retrofit: Install economizer ducting, dampers, instruments & controls to reset supply air temperature based on outside air temperature.	ol Retrofit: Insta	all econo	mizer	ğ	cţi	g, d	amp	Sers	. <u>ς</u>	stru	mer	ats &	00	ntrc	sis ti	ě	set	dns	β	air te	ďξ	era	ture	pas	ed	on o	utsi	de a	ir te	m m	eratu	ē.		
High Efficiency Motor Retrofits: Replace existing standard efficiency motors with high efficiency motors. Motor replacements consist of:	ofits: Replace ex	isting sta	andare	d ef	ficie	ő	Ē	tors	S K	투	ij	effic	ien	ار ا	notc	છું	ŝ	ţo	<u>eb</u>	acer	nen	ts c	ons	isto	ij									
3 Each - 5 HP Open Drip Proof Motors	Proof Motors		9	6 Each		9	ᇁ	ŏ	J La	Эri ф	P	- 10 HP Open Drip Proof Motors	1otc	S					т Ш	당	- 22	보	ŏ	- Je	Prip	<u> </u>	of	1 Each - 25 HP Open Drip Proof Motors	2					
1 Each - 5 HP Totally Enclosed Fan Cooled Motors	osed Fan Cooled	Motors	¥	ű	3ch	÷	土	ŏ	Den	2	ΡP	10 Each - 15 HP Open Drip Proof Motors	Š	tors					Ť Щ	넔	- 25	土	Š	tally	Ē	clos	ed F	an	S	ed	1 Each - 25 HP Totally Enclosed Fan Cooled Motors	હ		
5 Each - 7.5 HP Open Drip Proof Motors	Proof Motors		_	1 Each	뉴	20	ᇁ	ď	an C	Jrip	Pro	- 20 HP Open Drip Proof Motors	Aota	S					2 E	) Ch	- 30	土	Ŏ	en	Orip	P	of	2 Each - 30 HP Open Drip Proof Motors	δ					
1 Each - 7.5 HP Totally Enclosed Fan Cooled Motors	closed Fan Coole	d Motor		Each	넒	2	위	Tot	a⊩	Ē	Solo	- 20 HP Totally Enclosed Fan Cooled Motors	au	ŏ	Sed	ŝ	tors												ı	i				
										_	ı							ı	i					ļ									ı	
*	AUTHORIZED REQUESTOR (Type or Print)	(Type or Prin	Ç,																	ı	S	SIGNATURE	URE	ı										
PART B (Approving Official Only)	APPROVAL ACTION CODE:	ON CODE	Ż								Oυ	SPECIAL INTEREST CODE: FSTIMATED WORK START DATE:	IALI	NTE V C	RES	ST C.	ODE ART		<u>i</u>				Ш	Н		H	H		<b> </b> ĕ −		MON			
	PROGRAM INDICATOR CODE:	ATOR CO	ODE:				لــالـ	$\blacksquare$		_	: Ш	ESTIMATED WORK COMPLETION DATE:	<b>€</b> ATE	. 5	NO.	Š	MP.		į	ATE	.::								$\parallel \parallel$	$\dashv$	口	+	$\mathbb{H}$	
ENVIRONMENTAL IMPACT																							$\vdash$			S	S.	S	SOURCE OF FUNDS	ğ	_			_
YES NO FNVIRONMENTAL	WORK TO BE	# C	WORKCLA	Z,C	LASS	ဟ						¥	PR(	δ	APPROVAL AMOUNTS	ō	NTS							Ш	₫	DIRECT	_							
CONSIDERATION		)			_	6	L	L	"[	FUNDED	읽는	-				L	F	<u> </u>	ᇎ	UNFUNDED					₹ :	5 G	ATIC G	RE	AUTOMATIC REIMBURSEME	IRSE	AUTOMATIC REIMBURSEMENT	<b>-</b>		
EIS / EIA	SELF-HELP	u <u>a</u>				A 69		+	$oldsymbol{\perp}$	$\perp$	+	+			A 69		$\perp$		+	+				╛╽	2	ND	אַ ו	O W	SYO		ž			
COMPLETED	CONTRACT	5		ToTA_		* L	$\dashv$	$\blacksquare$			$\dashv$	$-\!$			چ اچ	-			+					Ш		터	튀		OTHER FUND CITATION	ĔH		H	г	
		ŀ					<b> </b>																ᅱ											
DESIGN APPROVAL	OVAL		_	DATE	١		_					۲	PPR	8	APPROVAL AUTHORITY	Ĕl	影	اح				$\dashv$	۲	PR	8	8	APPROVAL ACTION	Ţ		_	DATE			
	:	<u> </u>	<u></u>	NOM	丌	쑭	<u>.</u> .T		-	1													L	Г					ఠ	4	NON .	$\dashv$	جا	
(Piease type or print name)	ıt name)			4		$\dashv$	$\top$						g)	ase ty	(Please type or print name)	print n	ame)							₹ Z	APPROVED	OVE	APPROVED			$\dashv$		$\dashv$	4	
(Signature)					}		—							8	(Signature)	re)							ا	<u>,</u>	<u>ל</u>	5	֡֝֝֝֝֝֝֝֝ <u>֚</u>							

#### **Building 56301 Communications Equipment Facility - HVAC Controls Retrofit**

Building 56301 is a communications equipment facility. The 30,000 square foot, single floor, building heating, ventilating and air conditioning (HVAC) system is comprised of three rooftop-mounted multi-zone air handling units. Each unit is fitted with both hot and chilled water coils. Hot water is supplied by a hot water boiler and chilled water is provided by an air cooled reciprocating chiller.

#### **Existing Controls**

Existing HVAC controls in the building are a combination of electronic and pneumatic. Each HVAC zone is provided with a thermostat. One zone from each air handling unit is provided with a set-back thermostat. The thermostats are used to control supply air temperature to each zone. Set-back thermostats are used for temperature control during scheduled unoccupied periods.

For energy savings, existing controls provide for 100% outside air whenever the outside temperature is less than 62 °F. Heating is prevented whenever the outside air temperature exceeds 60 °F. Design temperature setpoints are as follows:

Summer Indoor Temperature:	77 °F
Winter Indoor Temperature:	68 °F
Cooling Economizer active below:	62 °F
No Cooling below:	65 °F
No Heating above:	60 °F

#### **HVAC Control System Retrofits Evaluated**

Three HVAC control system modifications are evaluated:

- 1. Integrated dry-bulb temperature control,
- 2. Supply air temperature reset control based on outside air temperature, and
- 3. Supply air temperature reset control based on the zone with the greatest demand.

#### **Integrated Dry-Bulb Temperature Control**

This type of control compares outdoor and return air dry-bulb temperatures to determine the economizer damper position. The economizer control strategy is illustrated in Figure F-1, below. Operation of the control is discussed below, proceeding from right to left in the diagram.

- When the outdoor temperature is greater than the return air temperature, the economizer dampers are closed. The system receives normal outdoor ventilation air. This is region A in Figure F-1.
- When the outdoor temperature is less than the return air temperature, the economizer dampers are fully open. Supply air is 100% outdoor air. Economizer dampers are held in this position as long as mechanical cooling is still required. This is region B in Figure F-1.
- As the outdoor air temperature drops, a point will be reached where use of 100% outdoor air eliminates the need for mechanical cooling. Beginning at this point, the economizer dampers modulate so that the mixture of outdoor and return air streams produces air at a temperature sufficient to eliminate mechanical cooling. This is region C in Figure F-1.
- At cooler temperatures, economizer dampers finally modulate closed and the system returns to normal ventilation levels. No mechanical cooling is required. This is region D in Figure F-1.

Finally, in some cases, upper and lower cutoff temperatures will be specified. When the outdoor air dry-bulb temperature is greater than the upper cutoff temperature, or lower than the lower cutoff temperature, economizer operation will be automatically disabled.

#### Supply Air Temperature Reset Based on Outside Air Temperature

For this type of control, supply air temperature is reset based on an outdoor air temperature schedule. For this control the maximum and minimum supply air temperatures and their corresponding outdoor air temperatures must be known.

For example, the design supply temperature is 57°F at a corresponding outdoor temperature (OAT) of 95°F, and is 67°F at a corresponding OAT of 55°F. Above 95°F OAT, the supply temperature is held constant at 57°F. Below 55°F OAT, the supply temperature is held constant at 67°F. Between 95°F and 55°F, the supply temperature varies as a linear function of outdoor temperature.

#### Supply Air Temperature Reset Based on Greatest Zone Demand

For this type of control, supply air temperature is reset based on zone loads. The system supply temperature is determined by computing the required supply air temperatures for each zone served by the system. For cooling operation, the coldest supply temperature among the zones is used as the supply temperature for the system. For heating operation, the warmest supply temperature is used as the supply temperature for the system. This models the use of a discriminating controller for resetting supply air temperature.

#### **Energy Saving Calculations**

Energy consumption for HVAC is estimated using the Carrier HAP computerized building energy simulation model. The building input data includes fifty-four spaces, three air handling units with a total of sixteen zones and a central heating and cooling plant. Central plant inputs include an air cooled reciprocating chiller and a hot water boiler.

Three simulations are conducted, a baseline run and one for each of the control system strategies evaluated. Both the control system retrofit simulations include integrated dry-bulb temperature controls and supply air temperature reset control. One run is with supply air temperature control based on outside air temperature; the other simulation includes supply air temperature reset based on the zone with the greatest demand.

The energy use simulation uses El Paso, Texas weather data, the city for which data is available that has weather the most similar to that of Fort Huachuca. Energy consumption results from simulations are adjusted based on heating and cooling degree-days for each location.

Results of computer simulations and energy saving calculations are provided in tabular form. Selected input data and outputs from each simulation are appended.

#### **Control Modifications**

While the control system modifications appear to be significant, actual equipment changes are minimal. Existing sensors and actuators are reused as much as possible, a new control unit is installed on each air handler, and additional sensors are installed as required. Controls are rewired at each air handling unit.

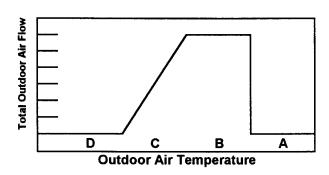


Figure F-1. Integrated Dry-Bulb Temperature Control

# Summary of HVAC Control Retrofit Evaluations

# **Energy Costs and Adjustment Factors**

Electric Usage Cost & Taxes, including demand charges: \$0.0629 per kWH 12.02 Uniform Present Worth, N=15

Natural Gas Cost, including Taxes: \$4.5080 per Mil BTU 14.17 Uniform Present Worth, N=15

# Adjustment for El Paso, Texas vs. Fort Huachuca Energy Use:

Cooling DD/Year	2,098	1,595	092'0
Heating DD/Year	2,678	2,551	0.953
Location	Simulations @ El Paso, Texas	Actual Site Fort Huachuca	Adjustment Factors:

<b>Economizer Control Description</b>						Gas				
Note: Both Supply Air Reset Options	Electric	Gas	Savings	Savings	Elec Saved	Saved	Constr.	Invest-	<b>LCCA</b>	SIR
include Integrated Dry-Bulb Control	kWH/Year	Therms/Yr	kWH/Year	Therms/Yr	r (\$/Year)	_	Cost (\$)	) ment (\$) Sa	Saved (\$)	
Baseline	415,473	32,087	,		,		'	ı	•	١
Supply Reset - Outside Air Temperature	382,501	28,726	25,067	3,202	\$1,577	\$1,443	\$14,775	\$16,548	\$39,403	2.38
Supply Reset - Greatest Zone Demand 385,988	385,988	30,504	22,416	1,508	\$1,410	\$680	\$21,374	\$23,939	\$26,580	1.1

Recommended Control Retrofit: Integrated Dry-Bulb Temperature Control with Supply Air Temperature Reset (Economizer Control) Based on Outside Air Temperature

				Date Prepa	red	Sheet C	of .
CONSTRUCTION COST ESTIMATE				Janua	ry 1995	1	1
Project ECIP Facility Energy Improvements				Project No.	Basis for Es	timate	
Location Fort Huachuca, Arizona	3				Code A (r	io design coi	npeted)
Engineer-Architect Keller & Gannon							
Drawing No. Building 56301 HVAC Control Retrofits		Estima	tor BIH		Checked By	RCL	
	Quant	ity	Labor & E	quipment	Ma	terial	
Line Item	No.	Unit	Per		Per		Total
	Units	Meas.	Unit	Total	Unit	Total	Cost
Integrated Dry-Bulb Economizer Control with							
Supply Air Reset Based on Outside Air Tempera	ture						
Return Air Temperature Sensor, installed	3	EA	\$181.33	\$544	\$90.67	\$272	\$816
DDC Controller, 16 Point, installed	3	EA	\$1,600	\$4,800	\$800	\$2,400	\$7,200
Damper Motor, modulating type	6	EA	\$13.68	\$82	\$280.00	\$1,680	\$1,762
Rewire, connect and test instrumentation	16	МН	\$27.35	\$438	\$12.50	\$200	\$638
Subtotal				\$5,864		\$4,552	\$10,416
Arizona Transaction Privilege Tax	3.75%	%		-		\$171	\$171
Subtotal							\$10,586
Contractor OH & Profit	25.0%	%					\$2,647
Subtotal							\$13,233
Bond	1.5%	%					\$198
Subtotal							\$13,431
Estimating Contingency	10.0%	%					\$1,343
Total Probable Construction Cost							\$14,775
Integrated Dry-Bulb Economizer Control with Supply Air Temperature Reset Based on Greater	st Zone	Dem	and or	Outdooi	Air Ten	nperatur	2
Supply Air Temperature Sensor, installed, including wiring	16	EA	\$181.33	\$2,901	\$90.67	\$1,451	\$4,352
Return Air Temperature Sensor, installed	3	EA	\$181.33	\$544	\$90.67	\$272	\$816
DDC Controller, 16 Point, installed	3	EA	\$1,600	\$4,800	\$800	\$2,400	\$7,200
Damper Motor, modulating type	6	EA	\$13.68	\$82	<del>                                     </del>	\$1,680	\$1,762
Rewire, connect and test instrumentation	24	мн	\$27.35	\$656	\$12.50	\$300	\$956
Subtotal	<b>†</b>	<u> </u>		\$8,984		\$6,103	\$15,086
Arizona Transaction Privilege Tax	3.75%	%		1		\$229	\$229
Subtotal							\$15,315
Contractor OH & Profit	25.0%	%					\$3,829
Subtotal							\$19,144
Bond	1.5%	%					\$287
Subtotal	Ī						\$19,431
Estimating Contingency	10.0%	%					\$1,943
Total Probable Construction Cost	Ī						\$21,374

# Life Cycle Cost Analysis Summary Energy Conservation Investment Program (ECIP)

Location:	Fort Huachuca,		Region No. 4	Project No.	
Project Title:	ECIP Facility En	ergy Improvement	s	Fiscal Year F	Y96
Discrete Portion	Building 56301:	Integrated Dry-Bulb	Temperature Contr	ol Preparer: KELLI	ER & GANNON
	Supply Air Tempe	erature Reset Based	I on Outside Air Tem	perature	
Analysis Date:	January 1995		Economic Life: 1	5 Years	
1. Investment	Costs				
A. Constructio	n Costs		\$14,775		
B. SIOH			\$886		
C. Design Cost	t		\$886		
D. Total Cost	1A + 1B + 1C)		\$16,548		
	ue of Existing Eq	uipment		<b>\$</b> 0	
<del>-</del>	Company Rebat	•		\$0	_
	ment (1D-1E-1F)				 \$16,548
					1.070.0
2. Energy Savi	ngs (+)/Cost(-):				
		for Discount Facto	ors: October 1994		
Energy	Cost	Saving	Annual \$	Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)
				. 2010. ( . /	outgo(o)
A. Elec.*	\$18.43	85.6	\$1,577	12.02	\$18,952
B. Dist		0	\$0	12.02	\$0
C. LPG		0	\$O		\$O
D. Natural Gas	\$4.51	320	\$1,443	14.17	\$20,451
E. Demand Say			W \$0	12.02	\$0 \$0
F. Total	11190	406		12.02	\$39,403
* includes dem	and charges	400	\$3,020		435,403
	Savings (+) or C	oet ( )			
3. Non Literay	Savings (+101 C	.ust (-).	<del></del>		
A. Annual Rec	urring ( + /-)		<b>\$</b> O		
	actor (Table A)			11.94	
	Savings/Cost (3	A v 2A11		11.34	\$0
(2) Discounted	Savings/Cost (S	A X SA II			<b>\$</b> 0
P. Non Popursi	na Savinas ( ) \	r Coot ()			
b. Non necum	ng Savings (+) o	Cost (-)			
Item	Sovinge/ L \	Year of	Discount	Discounted Co.	
i (GIII	Savings(+) Cost(-)(1)		Discount	Discounted Sa	
	C081(-)(1)	Occur. (2)	Factor(3)	ings(+)Cost(-)	(4)
a. L					
b.				<del></del>	
C.					
d. Total					
C Total Non Er	nergy Discounted	Savings (3A2+3	Bd4)	\$0	
4. First Year D	ollar Savings (2F	3 + 3A + )3Bd1/	/Economic Life)):	\$3,020	
5. Simple Payt	ack (1G/4):			5.48	Years
6. Total Net D	iscounted Saving	s (2F5 + 3C):		\$39,403	
7. Savings to I	nvestment Ratio	(SIR) 6/1G:		2.38	

# Life Cycle Cost Analysis Summary **Energy Conservation Investment Program (ECIP)**

Location:	Fort Huachuca, A	Arizona	Region No. 4	Project No.	
Project Title:	<b>ECIP Facility Ene</b>	rgy Improvement	s	Fiscal Year I	Y96
Discrete Portion	Building 56301: I	ntegrated Dry-Bulb	Temperature Contro	l Preparer: KELL	ER & GANNON
	Supply Air Temper	rature Reset Based	on Zone with Greate	est Demand	
Analysis Date:	January 1995		Economic Life: 15	Years	
1 Investment	Costs				
1. Investment A. Constructio			\$21,374		
B. SIOH	ii Costs		\$1,282		
C. Design Cost	•		\$1,282		
D. Total Cost (			\$23,939		
	ue of Existing Equ	inment	<b>425,555</b>	\$O	
	Company Rebate	-		\$0	
	ment (1D-1E-1F)	•		+0	_ \$23,939
<b>C.</b> 101 <b>C</b> 001					¥20,000
2. Energy Savi	ngs (+)/Cost(-):				
Date of NISTIF	85-3273 Used f	or Discount Facto	ors: October 1994		
Energy	Cost	Savina	A manual é	Diagonat	Diagonated
Source	\$/MBTU	Saving	Annual \$	Discount	Discounted
Source	\$/IVID I U	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)
A. Elec.*	\$18.43	76.5	\$1,410	12.02	\$16,948
B. Dist		0	\$0		<b>\$</b> 0
C. LPG		0	<b>\$</b> 0		\$0
D. Natural Gas	\$4.51	151	\$680	14.17	\$9,632
E. Demand Sav			.w \$0	12.02	\$0
F. Total	Y	227	\$2,090		\$26,580
* includes dem	nand charges		,		0,000
3. Non Energy	Savings (+) or C	ost (-):			
A. Annual Rec	-		<u></u> \$0		
(1) Discount Fa				11.94	
(2) Discounted	Savings/Cost (3A	A x 3A1)			\$O
R Non Requesi	ng Savings (+) or	Cost ()			
b. Non Necum	ing Savings (+) or	Cost (-)			
Item	Savings(+)	Year of	Discount	Discounted Sa	V-
	Cost(-)(1)	Occur. (2)	Factor(3)	ings(+)Cost(-)	
а.		0000 (2,	7 40(0)(0)	go( 1 /0001( /	V
b.		-			
C.					
d. Total					
<b>u.</b> 10tu.					
C Total Non Er	nergy Discounted	Savings (3A2 + 3	Bd4)	<b>\$0</b>	
4. First Year D	ollar Savings (2F3	3 + 3A + )3Bd1.	/Economic Life)):	\$2,090	
5. Simple Payl		•		11.46	Years
	iscounted Savings	(2F5 + 3C):		\$26,580	
	nvestment Ratio			1.11	

# **Motor Survey Data and Retrofit Calculations**

# **Survey Methodology**

The survey was limited to motors with a rated horsepower of 5HP or more since units below this size do not qualify for utility company rebates and have little likelihood of a cost-effective retrofit.

Performance data collected included operating speed RPM using a digital tachometer; and input voltage, input current and power factor using clamp-on instruments.

A summary of motor nameplate data and performance data collected during the field investigation appears in Table 1.

# **Energy-Efficient Motor Retrofit Evaluations**

The following data and assumptions were used to evaluate the feasibility of replacing existing motors with energy-efficient units:

- Efficiency improvements between standard and energy-efficient motors are valid at partial loads since energy-efficient motors operate at higher partial-load efficiencies than standard motors.
- The replacement energy-efficient electric motor will match the full-load speed of the replaced standard motor.
- Efficiencies of energy-efficient motors were based on averages provided in the DOE
  "Energy-Efficient Electric Motor Selection Handbook, Revision 3," January 1993. In
  instances where the average energy-efficient motor efficiency was less than the minimum
  required to qualify for a TEP rebate, the rebate-qualifying efficiency was used.
- Motor costs were based on the list price averages provided in the DOE motor handbook, adjusted for inflation and a contractor's discount.

The following formulae were used in the spreadsheet calculations summarized in Table 2:

Savings, kW = (1/Existing Eff. - 1/New Eff.) x Estimated Load Factor x Motor HP x 0.746 kW/HP

Savings, kWH = Savings kW x Op. Hours/Month x Op. Months/Year

Savings,\$/Year = (Saved,kWH x \$0.04835) + (Saved,kW x Op.Month/Yr ÷ 12 x \$127.84/kW-Yr)

Savings, LCC\$ = Savings, \$/Year x 15.08 UPV Factor for a 20 year life.

Construction Cost = From Table 3

SIOH & Design = Construction Cost x 0.12

TEP Rebate = From attached schedule from Tucson Electric Power Corporation

Total Investment = Construction Cost + SIOH & Design - TEP Rebate

SIR = Savings LCC\$ Total Investment

		Nameplate Deta								Mes	Messured Data			ວ	Calculated Values	Velues		
Building No.	Equipment	Motor Manufacturer	Motor HP	Voltage Rating	Enclosure Type {1}	Frame Size	Existing Efficiency	σ	Full Load Speed, RPM	Input Volts Avg.	Input Amps Avg.	Input P. F.	Speed	Operating Slip RPM	Load	HP Output	Input kW	Input KVA
15544	SA Fan HVAC Unit	BALDOR	20	230	TEFC	266T	0.830		1760	208	41.5	0.67	0.67 1773.0	Į	0.68	13.50	10.02	14.95
43083 43083	SA Fan AHU No. 1 SA Fan AHU No. 2	MARATHON DAYTON	7.5 7.5	200	900 900	213T 213T	0.853	(2)	1766 1740	200	23.3	0.7	1766.3 1784.5	33.7 15.6	0.75	5.62 1.94	6.66 2.62	8.07 4.58
63301 63301	SA Fan HVAC Unit SA Fan	CENTURY	90 90	460 460	000 900	S286T 326T	0.924		1760 1770	487.3 487.3	17.1 26.2	0.60	1790.7 1794.5	9.3 5.5	0.23	6.97 9.17	8.68 13.06	14.46 22.14
56301	CHW Circ. Pump 1	BALDOR	ம	460	ODP	1847	0.815		1726	¥ Z	Ą	Ą	Ą Z	۷ ۷	۷ ۷	۷ Z	₹ Z	٧
56301	CHW Circ. Pump 2	¥ Z	ю	460	ODP	ď	0.838	(2)	1760	¥ Z	Š	¥ Z	¥.	¥ Z	¥ Z	¥	¥	ď Z
58301	SA Fan, North HVAC Unit	₹ ¥	5 5	0 4	9 9	4 4 2 2	0.872	20	4 4 2 2	<b>4</b> 4	<b>∢</b>	<b>4</b> 2	<b>∀</b>	<b>₹</b> 2	g g	۷ <u>۲</u>	<b>∢</b>	۷ ×
56301	SA Fan, South HVAC Unit	( <b>4</b>	2 2	6 4	900	( ∢ Z Z	0.872	20	<u> </u>	2 Z	Ç ≼	(	(	ŽŽ	( ∢ Z Z	(	(	ξ <u>χ</u>
56301	Condenser Fan 1	¥:	7.6	460	ODD	¥:	0.863	<u> </u>	¥ :	¥.	¥ :	Š	¥ :	ď :	ž	¥:	¥:	ď.
66301	Condenser Fan 2	<b>4</b> 1	7.5	094	ago ;	<b>∀</b> !	0.853	(2)	<b>∢</b> :	Υ ¦	<b>₹</b>		۷ 2	۷ ۲	<u> </u>	<b>₹</b>	۷ :	Y !
908/9	CHW Circ. Pump 2	OS ELECT MIRS	97	094	2	324	0.880		ď Z	4///	22.2	0.81	1188.0 {3}	ď Z	<b>∢</b> 2	۷ Z	14.88	18.37
61701	Pool Circ. Pump	BALDOR	8	230	900	286U	0.895		1760	212.0	61.8	0.88	1766.0	36	0.88	17.50	16.28	18.94
62704	RA Fan	COULD	5 k	480	900	S216T	0.872	22	1760	485.3	10.1	0.58	1767.2	32.8	0.66	6.56	4.82	8.49
40179	E	9000	٩	004	5	7841	0.882	<u>(</u> 2	20/-	484./	70.7		7.84.7	9.0	0.32	9.	10.26	36./L
67801	AHU 1 SA Fan	MAGNATEK	5 :	460	ODP	S256T	0.860		1760	¥.	¥.	¥	V Y	<b>∀</b> N	¥ ;	¥,	¥	۷ ع
67601	AHU 2 SA Fen AHII 3 SA Fen	MAGNATEK	٠ د د	480	5 6	S2661 S268T	0.880		1760	484.7	7. 7. 6. 7. 6.		1785.1	14.9	0.37 NA	6.59 NA	7.08	12.17
67601	AHU 4 SA Fan	MAGNATEK	5 12	4 60	90	S256T	0.860		1760	NA.	? ¥		(2) 4.4 VA	(	( <u> </u>	ζ <b>∢</b>	S &	. ¥
67601	AHU 6 SA Fan	MAGNATEK	16	480	00P	S256T	0.860		1760	483.3	14.1		1789.5	10.6	0.26	3.94	6.20	11.83
67601	AHU / SA Fen HVAC Sys. Circ. Pump	MAGNATER	5 6	4 4 0 4 0 0	900	S266T NA	0.860 0.896		1760 NA	484.7 485.3	13.4	0.68	1782.0 1786.7	18 14.3	0.45 NA	8.75 NA	7.05	12.37 11.26
70525	Furnace SA Fan	LINCOLN	5	200	TEFC	266-U	0.860	(2)	1740	203.2	16.4	0.11	1775.0	26	0.42	4.17	0.84	6.78
80605	CHWP-1	US ELECT MTRS	5	460	900	254T	0.875		1745	Ą Ż	ď		Ą	Ą	۷ ۷	¥	¥	¥ Z
80506	CHWP-2	US ELECT MTRS	9 ,	460	900	264T	0.875		1745	471.1	13.1		780.5	19.6	0.35	6.32	5.77	10.69
80505	Fen Coil Unit, Rm 249	NA MA	9. 19.	6 4 0 6 0 6	ģ≨	S & Z		(2)	4 ×	467.6	0. 6.	0.0	0. <b>4</b> N	? <b>4</b>	0. A	. Z	4.42	8.32
80605	Fan Coil Unit, Rm 213	WEG	ம	480	TEFC	ď		2	1740	467.8	9.		1743.0	67	0.95	4.76	3.19	3.99
80505	VAVH2 West, Roof FCU	MAGNATEK	<b>5</b> i	460	900	S264T			1750	467.6	10.4		1792.0	ω,	0.16	2.40	2.84	8.40
80606	SA Ess Ess	MAGNATEK	9 6	94	a 0	S264T	0.895		1750	AN O	¥ ç	¥ 8	NA NA NA NA NA NA NA NA NA NA NA NA NA N	<b>₹</b>	۷ : 2 :	۷ :	¥;	Α ί
80505	SA Fan West	MAGNATEK	ဗ္ဂ	4 60	900	S286T	0.883		1750	0. VO	0 Z		400.0 (3)	{	ζ <u>γ</u>	4 4 2 2	7 A	0.20 NA
80606	RA Fan East	MAGNATEK	5	460	ODP	S216T	0.856		1750	474.6	9.2		1719.0 (3)	ď Z	¥	¥	3.39	7.64
80606	RA Fan West	MAGNATEK	5	460	900	S215T	0.856		1760	<b>∢</b>	۷ ۲	٧ ۲	<b>∀</b>	∢ Z	۷ ۲	Ϋ́	Ϋ́	۷ Z
81114	HW Circ. Pump	US ELECT MTRS	ص	200	ODP	184JM	0.815		1730	204.7	13.6	0.86	1731.0	69	0.99	4.93	4.15	4.82
NA - Data (1) ODP TEFC (2) Assur (3) Motol	NA - Data Not Available  [1] ODP = Open Drip Proof  TEFC = Totally Enclosed Fan-Cooled  [2] Assumed Value, Based on Average Standard Motor Efficiencies [3] Motor Operated by Variable Speed Drive	l Standard Motor Efficienci Prive	<u>s</u>															

Table 2. Summary of Energy Efficient Motor Retrofit Evaluations

Building		Motor	Enclosure	Oper. Hours/	Oper. Months/	Existing		š 2	Est. Avg.	Savinge	Sevinge	Savings \$/Year	Sevings	Construction	HOIS	TEP	Total	
Š.	Equipment	£	Type (1)	Month	Year	Efficiency		Efficiency [4]	Load Factor	¥	kWH	(2)	\$ CC	Cost \$ {6}	& Design \$	Rebate \$	Investment \$	SIR
		20	TEFC	730	12	0.830			0.70	1.231	10,783	\$679	\$10,235	\$1,282	\$154		\$1,356	
43083	SA Fan AHU No. 1	7.5	ODP	730	12	0.853		0.896	0.75	0.238	2,068	\$130	\$1,983	\$466	\$56	\$46	\$476	4.12
43083	SA Fen AHU No. 2	7.5	ODP	730	12	0.853	(2)	0.896	0.75	0.236	2,068	\$130	\$1,963	<b>\$</b> 466	\$28	\$46	\$478	4.12
53301	SA Fen HVAC Unit	30	ODP	730	12	0.924	0	0.928	0.70	0.073	940	\$40	8099	\$1,206	\$145	\$87	\$1,284	0.48
53301	SA Fen	20	ODP	730	12	0.930	•	0.936	0.70	0.180	1,577	66\$	\$1,498	<b>\$1,763</b>	\$212	<b>\$119</b>	¢1,855	0.81
56301	CHW Cire. Pump 1	ស	ODP	730	80	0.815	0	0.879	0.80	0.267	1,168	\$73	\$1,108	<b>¢</b> 391	\$47	\$17	\$421	2.63
56301	CHW Circ. Pump 2	ស	ODP	730	•	0.838	(2)	0.879	0.80	0.166	727	\$48	\$691	<b>\$391</b>	<b>\$47</b>	\$17	\$421	<u>.</u>
56301	SA Fan, North HVAC Unit	0	ODP	730	12	_	_	0.911	0.70	0.256	2,246	\$141	\$2,132	<b>\$588</b>	<b>\$68</b>	<b>\$26</b>	\$578	3.69
56301	SA Fan, Central HVAC Unit	5	ODP	730	12	0.872		0.911	0.70	0.256	2,246	<b>\$</b> 141	\$2,132	<b>\$566</b>	<b>\$</b>	<b>\$</b> 20	<b>\$578</b>	3.69
56301	SA Fan, South HVAC Unit	5	900	730	12	0.872	(2)	0.911	0.70	0.256	2,246	\$141	\$2,132	\$588	<b>\$68</b>	\$56	<b>\$578</b>	3.69
56301	Condenser Fan 1	7.5	900	200	•	0.853		968.0	0.70	0.220	199	\$48	<b>6694</b>	\$466	\$58	\$46	\$476	1.46
56301	Condenser Fan 2	7.5	900	200	•	0.853		968.0	0.70	0.220	199	\$48	\$694	\$466	\$56	\$46	\$476	1.48
57305	CHW Circ. Pump 2	25	TEFC	730	•	0.895	0	0.925	08.0	0.541	2,368	\$149	\$2,248	¢1,528	<b>\$183</b>	\$88	\$1,623	1.38
61701	Pool Circ. Pump	50	ODP	730	12	0.895	O	0.920	0.88	0.396	3,472	\$219	\$3,296	\$913	\$110	\$75	\$947	3.48
62704	RA Fen	5	ODP	730	12	0.872		0.911	0.70	0.256	2,246	<b>\$141</b>	\$2,132	<b>\$566</b>	80\$	\$56	\$578	3.69
62704	SA Fen	25	ODP	730	12	0.892	ە (2)	0.928	0.70	0.568	4,974	\$313	<b>\$4,721</b>	\$1,051	\$126	<b>\$87</b>	160,14	4.33
67601	AHU 1 SA Fen	15	ODP	180	6	0.860	o	0.915	0.70	0.547	887	\$69	<b>\$1,438</b>	\$736	88\$	\$58	\$766	1.88
67601	AHU 2 SA Fen	15	ODP	8	o	0.860	o	0.915	0.70	0.547	887	\$95	<b>\$1,438</b>	\$736	<b>\$8</b>	<b>\$2</b> \$	\$766	1.88
67601	AHU 3 SA Fen	5	ODP	98	œ	0.860	0	0.915	0.70	0.547	887	\$95	<b>\$1,438</b>	\$736	<b>\$</b> 88	<b>\$</b> 58	\$786	1.88
67601	AHU 4 SA Fen	15	ОБР	8	თ	0.860	o	0.915	0.70	0.547	887	\$95	\$1,438	<b>\$736</b>	88\$	<b>\$</b> 58	\$788	1.88
67601	AHU 5 SA Fen	15	ODP	180	o	0.860	o	0.915	0.70	0.547	887	\$95	<b>\$1,43B</b>	\$736	88\$	<b>\$58</b>	\$788	1.88
67601	AHU 7 SA Fan	15	900	180	თ	0.860	o	0.915	0.70	0.547	887	\$69	<b>\$1,43B</b>	\$736	<b>\$8</b>	<b>\$</b> 58	\$788	1.88
67601	HVAC Sys. Circ. Pump	15	ODP	180	o	0.895	o	0.915	0.80	0.219	354	<b>\$</b> 38	\$574	\$736	88	<b>\$</b> 28	\$766	0.75
70525	Furnace SA Fan	5	TEFC	365	60	0.860	(2) 0.	0.895 (3)	0.70	0.237	520	<b>\$</b> 40	809\$	\$796	96\$	\$40	\$852	0.71
80505	CHWP-1	15	ODP	730	9	0.875	Ó	0.915	0.80	0.447	1,959	\$123	\$1,859	\$736	88\$	\$58	\$766	2.43
	CHWP-2	5	ODP	730	80	0.875	Ó	0.915	0.80	0.447	1,959	<b>\$123</b>	\$1,859	\$736	88\$	<b>\$</b> 58	\$766	2.43
	HWP-1	7.5	ODP	730	•			968.0	0.80	0.333	1,459	<b>\$</b> 92	\$1,385	\$466	<b>\$</b> 56	<b>\$</b> 46	<b>\$478</b>	2.91
	Fan Coil Unit, Rm 249	7.5	TEFC	730	12		[2] O		0.70	0.221	1,935	<b>\$122</b>	<b>\$1,836</b>	<b>\$673</b>	<b>\$</b> 81	\$46	\$ 708	2.59
	Fen Coil Unit, Rm 213	S.	TEFC	730	12	_		0.875 (3)	0.95	0.204	1,789	<b>\$113</b>	\$1,698	\$496	699	\$35	\$520	3.26
	VAVH2 West, Roof FCU	5	ODP	130	12	0.895	o	0.915	0.70	0.191	1,676	\$105	<b>\$1,591</b>	\$736	\$8\$	<b>\$</b> 28	\$766	2.08
	VAVH2, Roof FCU	5	900	730	12	0.895	Ö	0.915	0.70	0.191	1,676	<b>\$105</b>	<b>\$1,591</b>	\$736	\$8\$	<b>\$</b> 28	\$766	2.08
	SA Fan East	ဓ	900	730	12	0.883	o	0.928	0.70	0.860	7,536	\$474	\$7,154	\$1,208	\$145	\$82	\$1,266	5.65
	SA Fan West	ဓ	900	730	12	0.883	o	0.928	0.70	0.880	7,536	\$474	\$7,154	\$1,206	\$145	\$82	\$1,288	5.85
	RA Fan East	9	900	130	12	0.856	o	0.911	0.70	0.368	3,226	\$ 203	\$3,062	\$566	<b>\$9</b> \$	<b>\$</b> 5 <b>6</b>	<b>\$578</b>	5.30
80202	RA Fan West	5	900	130	12	0.856	o	0.911	0.70	0.368	3,226	\$ 203	\$3,062	\$566	<b>\$</b> 98	\$58	<b>\$578</b>	5.30
91114	91114 HW Circ, Pump	2	ODP	730	8	0.815	Ö	0.879	66.0	0.328	1,439	<b>\$</b> 91	\$1,366	\$391	\$47	\$17	\$421	3.24
Totals for	Totals for Motor Retrofits with SIR > 1.0	Q								13.213	78,671	<b>\$5,198</b>	\$78,386	\$22,615	\$2,714	<b>\$1,778</b>	\$23,551	3.33

ODP = Open Drip Proof
 TEFC = Totally Enclosed Fan-Cooled
 Assumed Value, Based on Average Standard Motor Efficiencies
 Minimum Qualifying Efficiency for TEP Rebates
 Average Efficiency for Energy Efficient Motor from DOE Energy Efficient Electric Motor Selection Handbook, Rev. 3, January 1993
 Energy Cost Saved is based on \$6.04835 per kWH and \$127.84 per kW-Year, usage and demand costs, respectively.
 See Table C - 3

TABLE 3. ENERGY EFFICIENT MOTOR RETROFIT COSTS

Motor Size			<b>ODP Material</b>	TEFC Material	ODP Construction	TEFC Construction	Motor Size
HP	Manhours Cost	Cost \$ {1}	Cost \$ {2}	Cost \$ {2}	Cost \$ {3}	Cost \$ {3}	Ŧ
2	3.6	9/	197	269	\$391	\$496	5
7.5	3.8	80	245	388	\$466	\$673	7.5
10	4.0	85	309	468	\$566	\$796	10
15	5.0	106	406	625	\$736	\$1,053	15
20	6.1	129	506	761	\$913	\$1,282	20
25	6.4	135	596	925	\$1,051	\$1,528	25
30	6.7	142	969	1,095	\$1,206	\$1,784	30
40	8.0	169	867	1,404	\$1,491	\$2,269	40
50	10.0	212	1,013	1,729	\$1,763	\$2,799	50

{1} \$21.15/Hr Electrician per Means Bare Trade Rate, adjusted for location Labor - Use 2 x Means Manhours

Jan. 1993 Escalated from 1990 Prices = (1 Jan. '94 Index/1 Jan. '90 Index) = (1887/1676) Reduced by 40% to Equal 'Supply' Contractor Price, Therefore {2} Averages from "DOE Energy Efficient Electric Motor Handbook Rev. 3" Average List Price Multiplier = (0.60)(1887/1676) = 0.676

{3} Construction Cost = {Labor Cost + (Mat'l Cost  $\times$  1.0375)}  $\times$  1.25 OH & P  $\times$  1.015 Bond  $\times$  1.10 Contingency

# **TUCSON ELECTRIC COMPANY HIGH EFFICIENCY MOTOR REBATES**

1994 TOTALLY ENCLOSED FAN COOLED HIGH-EFFICIENCY MOTOR REBATE SCHEDULE

MOTOR		MINIMUM QUALIF	YING EFFICIENCY			BASE /	EBATE:		BONUS
HP****	900 RPM	1200 RPM	1800 RPM	3600 RPM	900 RPM	1200 RPM	1800 RPM	3600 RPM	FACTOR
5	85.5	<b>07.5</b>	87.5	87.5	\$20	\$35	\$35	\$35	\$10 per %
7.5	85.5	89.5	89.5	88.5	<b>\$35</b>	\$50	\$50	\$45	\$15 p <b>å</b> r %
10	88.5	89.5	89.5	89.5	840	840	840	840	\$15 per %
15	88.5	90.2	91.0	90.2	\$80	\$60	\$60	\$60	\$15 for %
20	89.5	90.2	91.0	90.2	\$65	-850	\$55	\$50	\$25 per %
25	89.5	91.7	92.4	91.0	\$85	\$80	\$85	\$65	\$30 per %
30	91.0	91.7	92.4	91.0	\$75	\$70	\$80	\$65	\$35 per %
40.	91.0	93.0	93.0	91.7	\$145	\$155	\$145	\$105	\$55 per %
50	91.7	" <b>93</b> .0	<b>93</b> .0	92.4	\$85	\$100	\$85	\$60	\$55 per %
60	91.7	93.6	93.6	93.0	\$190	\$200	\$180	\$180	\$100 per %
75	93.0	93.6	94.1	93.0	\$210	\$190	\$200	\$150	\$100 per %
100	<b>\$3.0</b>	94.1	94.5	93.6	\$290	\$280	\$290	\$280	\$130 per %
125	93.6	94.1	94.5	94.5	\$645	\$525	\$555	\$675	\$300 per %
150	93.6	96.0	<b>95</b> .0	94.5	\$545	\$635	\$545	\$635	\$300 per %
200	94.1	95.0	95.0	95.0	\$510	\$600	\$425	\$595	\$425 per %

1994 OPEN DRIP PROOF HIGH-EFFICIENCY MOTOR REBATE SCHEDULE

MOTOR		MINIMUM QUALIF	YING EFFICIENCY		10	BASE	REBATE		BONUS
HP	900 RPM	1200 RPM	1800 RPM	3600 RPM	900 RPM	1200 RPM	1800 RPM	3800 RPM :	FACTOR
5	87.5	87.5	87.5	85.5	\$15	\$15	\$15	\$10	85 per %
7.5	99.5	66.5	88.5	87.5	840	830	\$35	\$35	\$10 per %
10	89.5	\$0.2	89.5	88.5	840	\$35	\$40	\$35	\$10 per %
15	<b>89</b> .5	90.2	91.0	89.5	\$56	\$40	\$50	\$55	\$15 per %
20	90.2	91.0	91.0	90.2	\$60	\$55	\$60	\$40	\$20 per %
25	90.2	91.7	91.7	91.0	\$70	\$65	\$55	\$60	\$20 per %
30	91.0	92.4	92.4	91.0	\$70	875	870 A	\$65	\$25 per %
40	91.0	93.0	93.0	91.7	\$95	\$85	\$90 👙	\$70	\$35 per %
50	91.7	93.0	93.0	92.4	\$95	\$95	\$100	\$95	\$40 per %
60	92.4	93.6	93.6	93.0	\$120	\$105	<b>\$1</b> 10	\$130	\$40 per %
75	93.6	93.6	94.1	93.0	\$105	\$85	\$105	\$90	\$45 per %
100	93.6	94.1,	94.1	93.0	\$125	\$125	\$115 ·	\$120	\$55 per %
125	93.6	94.1	94.5	93.6	\$155	\$175	\$185	\$120	\$110 per %
150	93.6	94.5	95.0	93.6	\$230	\$230	\$295	\$255	\$135 per %
200	93.6	94,5	95.0	94.5	\$335	\$335	\$420	\$405	\$210 per %

# Life Cycle Cost Analysis Summary Energy Conservation Investment Program (ECIP)

Location: Fort Huachuca, Arizona Region No. 4 Project No. Project Title: ECIP Facility Energy Improvements Fiscal Year FY96 Discrete Portion: **Energy Efficient Motor Retrofits** Preparer: KELLER & GANNON Analysis Date: January 1995 Economic Life: 20 Years 1. Investment Costs \$3,810.77 A. Construction Costs \$22,615 B. SIOH \$1,357 C. Design Cost \$1,357 D. Total Cost (1A + 1B + 1C) \$25,329 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$1,778 G. Total Investment (1D-1E-1F) \$23,551 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Energy Cost Annual \$ Saving Discount Discounted Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. \$57,466 \$14.17 269.0 \$3,811 15.08 B. Dist 0 \$0 \$0 C. Demand (9mos) \$95.88 3.501 kW \$336 15.08 \$5,062 D. Demand (6 mos 2.969 \$63.92 \$190 kW 15.08 \$2,862 E. Demand(12 mos \$127.84 6.743 kW \$862 15.08 \$12,999 F. Total \$5,198 \$78,390 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) \$0 (1) Discount Factor (Table A) 11.94 (2) Discounted Savings/Cost (3A x 3A1) \$0 B. Non Recurring Savings (+) or Cost (-) Item Savings(+) Year of Discount Discounted Sav-Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4)a. h. c. d. Total C Total Non Energy Discounted Savings (3A2+3Bd4) \$0 4. First Year Dollar Savings (2F3 + 3A + )3Bd1/Economic Life)): \$5,198 5. Simple Payback (1G/4): 4.53 Years 6. Total Net Discounted Savings (2F5+3C): \$78,390 7. Savings to Investment Ratio (SIR) 6/1G: 3.33

**EEAP Energy Savings Opportunity Survey** Fort Huachuca, Arizona Work Request 4 **Lighting Fixture and Control Retrofits** F:\PROJ\1640313\WORD\WORKREQ.COV 950210

WORK REQUEST (IFS-M)
(For use of this form, see AR 420-17 and DA PAM 420-6; the proponent agency is USACE.)

	CUSTOMER	DOCUMENT	눌	-	3								1												H		DATE	l	Γ
PART A (See Instructions)	CODE	SERIAL	. 02	H.									었	π Τ	SHORT JOB DESCRIPTION	SCF	Ě	Z O								₹ A	WOW	$\vdash$	χ
ш.	Э			5	۵	-		I G H		쁘	Ξ	X	b	RE	ૐ	0 0	Z	TROL	0	7	ပ	CHANGE	N R	E	S			Н	
INSTALLATION ABBREVIATION OF										ā	BUILDING / FACILITY NUMBERS	1/5	ACIL	Ĭ.	NOM	SERS													
FACILITIES		7			က			4				ς.			9			7				89			G		•	10	
1 H U A 8 1	5 5 4 4 2 0 0 3 0 5 8 0	2 0 2 0	5 9	0 5	4 6	7 7	4 0	3 0	00	2 5 7 9	m 0	0 0	<b></b> ∞	9 1	w ←	0 +	ro .	7 4	7	8	6 1	7 0	- 6	7	0 2	7	0	2	20
REMARKS: This Work Request is a result of the EEAP, ESOS conducted by Keller & Gannon under Contract DACA05-C-92-0155.	est is a result of	the EE	AP.	ŢŠ	8	5		ted b	Ž		- S	annc	ř	nde	၂ဦ	₽		ACA ACA	95	-95	9		Economic analysis results	랿	inaly	sis I	resut	ts	
are: \$42,996 energy and \$ 4,105 O&M annual cost savings; T	4,105 O&M ann	ual cost	t sav	ing	S; ]	ota	ပ္	st of	\$28	7,69	5 les	T S	SP C		epa	e of	\$36	,359	S	11	2.25	otal Cost of \$287,695 less TEP Co. rebate of \$36,359; SIR = 2.25; Payback Period = 5.34 years.	back	Peri	# po	5.34	yea	S	
INSTALLATION NAME:	,				ಠ	STC	Ä	CUSTOMER NAME	ا			-	t	}		8	ž	¥	ļ	ŀ		-	L	8		N I	MBER	ı	
FORT HUACHUCA, ARIZONA	¥.	Dire	द्ध	rate	Ö	핊	<u>i</u>	Directorate of Engineering and Housing W     L	and	윈	usin	₹				M A	$\exists$	5	ST		$\equiv$	E I N 6 0	0 2		5 3	<u>س</u>	_	8 6	_
WORK DESCRIPTION (Description of Work requested): Perform the following lighting fixture and lighting system control modifications; see attached information for details:	or Work requested ):	Perforn	n Ete	<u>5</u>	<u> </u> 	gu .	ghti	ng fix	ture	and	fixture and lighting system control modifications and lighting system control modifications.	ng s	yste	E I	ontro	E E		atio	15; see	eea	ttach	ed In	orma	ton :	or d	etails			
	T8 Lamps - 2 Lamp	, F30T12	Fxtr	en.	: 2	نہ :	2 L		ot	Sata .	Electr. Blats & T8 Lmps - 4 Lmp F96712 Fxtrs		4.		F96T	12 F3	tra c		249 EA		5 7 X	17W Comp. Fluor, Lamp for Table Lamps	1	ים. משני	for j	Table		S .	
	nps - 1 Lmp F34T1;	2 & F40T	12 F)	ctrs	2	÷	2 EA		T 13	ŏ ×	DTT 13W Comp. Fluor. Lamps for Downlights	luor.	Lam	os fo	Õ	vnlig			33 EA		50W	150W HPS Lamps & Blats for 250W MV Fxtrs	ampa	& Blat	s for	250M	₹	Fxtra	
D2.1401EA Electr. Bists & T8 Lmps - 2 Lmp F34T12 & F40T12 Fxtrs	1ps - 2 Lmp F34T1	2 & F40T	12 F)	ctrs	<b>G</b> 2		24 EA		200	Co Co	TRI 20W Comp. Fluor. Lamp Replacements	uor.	Lamp	Rep	lacen	ents		75.	54 EA		<b>№</b>	200W HPS Lamps & Bists for 400W MV Fxtrs	sdue	& Blat	s for	400W	××××××××××××××××××××××××××××××××××××××	Fxtrs	
D5. 671 EA Reflector, DeLmp 4 to 3 Lmps w/ Electr. Bists & T8 Lmps	to 3 Lmps w/ Electr	. Blsts &	78 Lr	mps	ၓ	,	71 EA		×	Comp	TT 7W Comp. Fluor. Lamp Replacements	۲. La	m F	eplac	semes	nts		Σ.	239 EA		eiling	Ceiling Mounted PIR Sensors to Control Lights	Hed Pif	Sen:	sors t	o Con	trol Li	ghts	
E1. 48 EA Electronic Ballasts - 2 Lamp F48T12HO Fxtrs	2 Lamp F48T12HO	Fxtrs		Ì	2	Ţ.	45 EA		13	ŏ∣	DTT 13W Comp. Fluor. Lamps for Ceiling Fxtr	nor	Lam	os fo	Cei	ing		8	162 EA		/all S	Wall Switch Type PIR Sensors to Control Lights	ype P	IR Se	nsors	to C	ntrol	Light	
<b>T</b>	AUTHORIZED REQUESTOR (Type or Print)	(Type or Pri	int)																SIG	SIGNATURE	IRE								
PART B (Approving Official Only)	APPROVAL ACTION CODE: WORK REQUEST PRIORITY: PROGRAM INDICATOR CODE:	ION COD T PRIORI CATOR C	Ē: 17: ODĒ:				لاستنسا				SPE( ESTII ESTII	SPECIAL INTEREST CODE: ESTIMATED WORK START DATE: ESTIMATED WORK COMPLETION DATE:	INTE!	REST ORK ORK	STAF	E: RT D/	TE:	DATE	.::								MON	<del>│                                    </del>	×
ENVIRONMENTAL IMPACT																							ပ္တ	SOURCE OF FUNDS	Ö	QN5	ر ا		
YES NO ENVIRONMENTAL CONSIDERATION	WORK TO BE PERFORMED	JED TE	3	/0.R	WORKCLASS	SSI	L	-	라	FUNDED	<del> </del>	APPROVAL AMOUNTS	JVAL ,	AMC.	TNUC	<u> </u>		UNFUNDED		Г			DIRECT AUTOMATIC REIMBURSEMENT	TICR	EIMB	URSE	MEN	_	
EIS / EIA INITIATED	SELF-HELP	u <u>β</u>			T	A 4A	<u>.</u>	$\blacksquare$	+	$+ \overline{1}$		$\Box$	<b>47</b>	A 49		++		++		$\top$		2	FUNDED REIMBURSEMENT	RE N	BUR	SEME			
COMPLETED	CONTRACT	L C		<b></b> 2	_1₫ 	φ <del>-                                   </del>		干	+	+1		Д	<b>•</b> • •	\$ \$			世					H	Ĕ₩	OTHER FUND CITATION		ĔΗ	<u>ج</u> ا		
DESIGN APPROVAL	OVAL			4	DATE		$\Box$	Ш			$ \hat{\ } $	APPROVAL AUTHORITY	ĕ	₽		Σ				Н	AP	APPROVAL ACTION	L ACT	S O	Н		DATE		П
sing as any energy	(700-		<u></u>	∑├	NON -		۴_	•											-				Į,		<u></u> 6	-	NOM NOM		ξ -
rease type of print herre)	( Name)		7	1	$\dashv$	4	T						dki asi	<b>1</b>	(Freese type of print name)	,						APPROVED DISAPPROVED	PROV	ED	1_	$\dashv$		4	
(Signature)		 					$\dashv$						(SK	(Signature)						_			Ì		_				

# Lighting Fixture & Control Retrofits Table of Contents

Lighting Fixtu	re & Control Retrofits	1
Fixture Retrofit	Evaluations	1
Controls Retrof	fits	3
Table 1	Summary of Lighting and Controls Retrofit Evaluations	4
Lighting Fixt	ure Modifications	
Table 2	Lighting Retrofit A Exit Light LED Retrofit	6
Table 3	Lighting Retrofit B2 F30T12, 2 Lamp Fixture: Replace Existing Lamps and Ballasts	7
Table 4	Lighting Retrofit D1 F34T12 and F40T12, 1 Lamp Fixture: Replace Lamps and Ballasts	9
Table 5	Lighting Retrofit D2 F34T12 and F40T12, 2 Lamp Fixtures: Replace Lamps and Ballasts	10
Table 6	Lighting Retrofit D5 F34T12 and F40T12, 4 Lamp Fixtures:  Delamp to 3 F32T8 Lamps and Electronic Ballast plus Reflector	17
Table 7	Lighting Retrofit E1 F48T12HO, 2 Lamp Fixtures: Replace Existing Ballasts with Electronic Ballasts	18
Table 8	Lighting Retrofit F1 F96T12, 2 Lamp Fixtures: Replace Lamps and Ballasts	18
Table 9	Lighting Retrofit F2 F96T12, 4 Lamp Fixtures: Replace Lamps and Ballasts	18
Table 10	Lighting Retrofit G1 Incandescent 60W Downlight: Replace Lamp with Compact Fluorescent	18
Table 11	Lighting Retrofit G2 Incandescent 75W Downlight: Replace Lamp with Compact Fluorescent	19
Table 12	Lighting Retrofit G3 Incandescent 40W Ceiling or Wall-Mounted Fixture: Replace Lamp with Compact Fluorescent	19
Table 13	Lighting Retrofit G4 Incandescent 60W Ceiling or Wall-Mounted Fixture: Replace with Compact Fluorescent	19
Table 14	Lighting Retrofit G5 Incandescent 100W Ceiling Fixture: Replace Lamp with Compact Fluorescent	19
Table 15	Lighting Retrofit H1 Incandescent 60W and 70W Table Lamps: Replacement Compact Fluorescents	20
Table 16	Lighting Retrofit J1 150W MV Pendant-Mount Fixture: Replace Lamp and Ballast with HPS	22
Table 17	Lighting Retrofit J2 400W MV Pendant-Mount Fixture: Replace Lamp and Ballast with HPS	22

# **Lighting Controls Modifications**

Table 18	Lighting Controls Retrofit K1: Ceiling Mounted PIR Occupancy Sensors	23
Table 19	Lighting Controls Retrofit K3: Wall Switch PIR Occupancy Sensors	25
<u>Schedules</u>		
Table 20	Energy Use and Operating Costs for Existing Features	28
Table 21	Energy Use and Operating Costs for Proposed Lighting Fixture Retrofits	29
ECIP Life Cy	cle Cost Analysis Summaries	30
Unit Cost Est	imates for Lighting Fixture and Controls Modifications	49

# **Lighting Fixture & Control Retrofits**

Two types of energy saving retrofits are included in this project:

- Lighting fixture modifications
- Lighting controls modifications

Specific retrofits included in this project are listed below. Evaluations for these retrofits are summarized on Table 1.

**Lighting Fixture and Control Retrofits** 

Proj.	Description Lighting Fixture and Control Retrollts	Туре	Table
Α	Exit Fixture LED Retrofit	Fixture	Table 2
B2	Install Electronic Ballasts and T8 Lamps - 2 Lamp F30T12 Fixtures	Fixture	Table 3
D1	Install Electronic Ballasts and T8 Lamps - 1 Lamp F34T12 & F40T12 Fixtures	Fixture	Table 4
D2	Install Electronic Ballasts and T8 Lamps - 2 Lamp F34T12 & F40T12 Fixtures	Fixture	Table 5
D5	Install Reflector and Delamp 4 Lamp Fixtures to 3 Lamps with Electronic Ballasts and T8 Lamps	Fixture	Table 6
E1	Install Electronic Ballasts - 2 Lamp F48T12HO Fixtures	Fixture	Table 7
F1	Install Electronic Ballasts and T8 Lamps - 2 Lamp F96T12 Fixtures	Fixture	Table 8
F2	Install Electronic Ballasts and T8 Lamps - 4 Lamp F96T12 Fixtures	Fixture	Table 9
G1	Install DTT 13W Compact Fluorescent Lamps for Downlight Incandescents	Fixture	Table 10
G2	Install TRI 20W Compact Fluorescent Lamps to Replace Incandescents	Fixture	Table 11
G3	Install TT 7W Compact Fluorescent Lamps to Replace Incandescents	Fixture	Table 12
G4	Install DTT 13W Compact Fluorescent Lamps for Ceiling Incandescents	Fixture	Table 13
G5	Install TRI 23W Compact Fluorescent Lamps to Replace Incandescents	Fixture	Table 14
H1	Install 17W Compact Fluorescent Lamps for Incandescent Table Lamps	Fixture	Table 15
J1	Install 150W HPS Lamps and Ballasts to Replace 250W MV Lamps	Fixture	Table 16
J2	Install 200W HPS Lamps and Ballasts to Replace 400W MV Lamps	Fixture	Table 17
K1	Install Ceiling Mounted PIR Occupancy Sensors to Control Lights	Control	Table 18
К3	Install Wall Switch Type PIR Occupancy Sensors to Control Lights	Control	Table 19

Results of economic evaluations are summarized on Table 1. Calculations for each retrofit included in this project appear on Tables 2 through 19. Detailed cost estimates, Life Cycle Cost Analysis summary sheets and catalog data for selected components are appended. Lighting and control retrofit evaluations which resulted in SIR's below 1.0 are not listed here. Refer to Appendix H of the EEAP, ESOS for Fort Huachuca, prepared under Contract No. DACA05-C-92-0155 for information on energy saving opportunities evaluated but not recommended.

## **Fixture Retrofit Evaluations**

Lighting fixture modifications are considered. Most existing fluorescent fixtures use 40-watt T12 fluorescent lamps and standard ballasts. (Some energy saving 34-watt lamps and energy saving ballasts are installed, as are some F32T8 lamps, but they do not predominate.) Room-by-room calculations for fixture modifications included in this project appear as Tables H-2 through H-19.

Retrofit A involves the replacement of existing incandescent lamps in exit signs with light emitting diode (LED) lamp kits.

Retrofits B, D, E and F are one-for-one lamp and/or ballast replacements in existing fixtures. Retrofitting existing one-lamp fluorescent fixtures with electronic ballasts and 32-watt T8 lamps will reduce fixture input power by about 19 watts if standard core and coil ballasts are installed.

Project D5 involves installing a reflector and delamping existing 4-lamp fluorescent fixtures to three F32T8 lamps with electronic ballast.

Retrofits G and H are for replacing existing incandescent lamps in various fixtures with compact fluorescent lamps and ballasts. Retrofits are developed assuming the use of fluorescent retrofit lamps with standard screw-in bases. Acceptable substitute products are available for installation into standard screw-in bases which, when screwed-in, deform the existing base such that, thereafter, they are useable only for compatible compact fluorescent lamps. Costs are roughly equivalent.

Retrofits J involve the replacement of existing mercury vapor lamps with high pressure sodium lamps and ballasts.

Pricing shown on the attached unit cost estimates are taken, in large part, from the February 1994 issue of "Defense General Supply Center - Energy Efficient Lighting Catalog". Components are available at prices listed in this document to DoD agencies; it is assumed that contractor pricing would be similar.

Energy savings and economic analysis calculations for proposed fixture retrofits use the following procedures:

**Lighting Retrofit Evaluation Calculations** 

Label	Contents / Calcu	llation Explanation
RET_TYP	Retrofit type	(See schedule above)
KW_SVD	E_KW) ¾ (S_KW) = Demand savings (kW)	(Difference in "Watts per Fixture" values in Tables 20 and 21 (See note below)
KWH_SV	KW_SVD * HR/WK * 52 * Demand Factor = = Electric savings from retrofit	Usage Schedule (HR/WK) and Demand Schedule are provided in Appendix G of the EEAP, ESOS for Fort Huachuca.
DEM_\$/Y	KW_SVD * \$127.84 per kW-Year = = Annual electric demand cost savings	(TEP power demand charge including Taxes)
USE_\$/Y	KWH_SVD * \$0.04835 = Annual electric powe	r cost savings (TEP power use charge including Taxes)
PWR_LCC\$	[DEM_\$/Y + USE_\$/Y] * 12.02 =	Life cycle savings, Life of 15 years;
		Uniform Present Value (UPV)
O&M_\$/Y	[Table 20 \$/1000 LAMP-Hr - Table 21 \$/1000 * No. FXTRS * NO. LAMPS / 1000 = Annual C replacements; refer to Tables 20 and 21	
O&M_LCC\$	(O&M_\$/Y * 11.94) = Life cycle	O&M cost for Life of 15 years; UPV factor
TOT_\$/Y	(DEM_\$/Y + USE_\$/Y + O&M_\$/Y) = Total an	nual cost savings
TOT_LCC\$	(O&M_LCC\$ + PWR_LCC\$) = Total life cycle	cost savings
CONST\$	Retrofit Unit Cost * NO. FIXTURES = Construction attacks at the contract of th	ction cost from retrofit unit cost estimates, ached
SIOH	CONST\$ * 0.120 = SIOH and design at 6% ea	ch of construction cost
REBATE	REBATE = Tucson Electric Power rebates for ballast and HPS fixture retre	r lighting lamp and/or fluorescent electronic ofits (See schedule in Appendix B)
INVE\$T	CONST\$ + SI0H Ä REBATE = Total investment	nt per ECIP guidance
SIR	(TOT_LCC\$) / (INVE\$T) = Savings-to-investm	ent ratio
PAYBCK	(INVE\$T) / (TOT_\$/Y) = Payback period (year	s)
Mades Danson de		

Note: Parameters shown above for existing and retrofit (savings) cases are indicated by prefixes: "E\_" and "S\_", respectively, corresponding to labels used above to explain lighting energy use calculations. Refer to Tables 20 and 21 for existing and proposed retrofit energy use and O&M costs.

## **Controls Retrofits**

Lighting control retrofits included involve installing occupancy sensor switching in offices, conference rooms, and other areas where lights are normally turned on for periods when no one is present. Two types of occupancy sensors are considered. A wall switch type passive infrared (PIR) sensor is evaluated as Retrofit K3. This is the least expensive control retrofit investigated and simply replaces a small office's toggle switch. For larger offices and open areas, ceiling mounted sensors are evaluated. Ceiling mounted switches are more expensive since a relay and additional wiring are required.

Retrofit K1 proposes ceiling-mounted PIR sensors for rooms with more than 6 fixtures, it is assumed that up to 12 fixtures may be controlled by each sensor installation

Detailed evaluations appear as Tables 18 and 19.

Energy savings of at least 25% have been achieved in many similar retrofits according to Arizona Public Service Company. This savings lis assumed here. This figure may be low for many offices observed during field investigations. In several buildings, many offices and other rooms were observed to be unoccupied at least 50% of the time (with lights left on). Manufacturers of occupancy sensor switches report savings of between 35% and 75% depending on the application.

Energy and cost savings are determined using the same formulae as are shown above for lighting energy use calculations. The operating hours per week are simply factored down.

Table 1. Summary of Lighting and Controls Retrofit Evaluations

Lighting ECO Number	Description	Number Retrofit Units	Demand Saved (kW)	Energy Saved (kWH/Year)	Total LCC Cost Saved (\$)	ECO Investment (\$)	SIR	Payback (Years)
∢	Exit Fixture LED Retrofit	108	1.97	17,171	\$11,025	\$5,438	2.03	5.94
B2	Install Electronic Ballasts and T8 Lamps - 2 Lamp F30T12 Fixtures	124	3.72	8,124	\$11,682	\$5,502	2.12	5.66
D1	Install Electronic Ballasts and T8 Lamps - 1 Lamp F34T12 & F40T12 Fixtures	120	1.72	990'6	\$6,286	\$5,217	1.20	9.99
D2	Install Electronic Ballasts and T8 Lamps - 2 Lamp F34T12 & F40T12 Fixtures	1,401	30.03	107,700	\$108,164	\$67,229	1.61	7.47
D5	Install Reflector and Delamp 4 Lamp Fixtures to 3 Lamps with Electronic Ballasts and T8	671	49.34	144,543	\$165,753	\$43,531	3.81	3.16
E1	Install Electronic Ballasts - 2 Lamp F48T12HO Fixtures	48	1.58	5,491	\$5,625	\$2,107	2.67	4.50
F1	Install Electronic Ballasts and T8 Lamps - 2 Lamp F96T12 Fixtures	20	08.0	1,872	\$1,932	\$1,822	1.06	11.35
F2	Install Electronic Ballasts and T8 Lamps - 4 Lamp F96T12 Fixtures	-	0.08	166	\$187	\$182	1.03	11.73
G1	Install DTT 13W Compact Flourescent Lamps for Downlight Incandescents	2	60.0	139	\$306	\$37	8.36	1.44
G2	Install TRI 20W Compact Flourescent Lamps to Replace Incandescents	24	2.37	4,547	\$65'6\$	\$62	153.60	0.08
G3	Install TT 7W Compact Flourescent Lamps to Replace Incandescents	71	2.36	4,488	\$9,175	\$1,166	7.87	1.52
G4	Install DTT 13W Compact Flourescent Lamps for Ceiling Incandescents	45	2.06	3,786	\$7,117	\$876	8.12	1.48
G5	Install TRI 23W Compact Flourescent Lamps to Replace Incandescents	28	2.31	4,965	\$5,386	\$894	6.02	2.00
H1	Install 17W Compact Fluorescent Lamps for Incandescent Table Lamps	249	10.71	23,384	\$41,911	\$4,876	8.60	1.40

Table 1. Summary of Lighting and Controls Retrofit Evaluations

Number 1450	-	Number	Demand	Energy	Total LCC		Ç	Payback
+		Units	Oaved (KW)	(kWH/Year)	navec 1son	mvestment (s)	בה	(Years)
11 Install I	Install 150W HPS Lamps and Ballasts to	33	3 20	7 7 7 8	40 724	86 569	1 23	9.05
Replace	Replace 250W MV Lamps	CO	3.20	0,440	40,124	900,00	 	3.03
Install 2(	Install 200W HPS Lamps and Ballasts to	E 4	11 20	32 A 7E	000 664	200 05	2 0.7	2.06
32 Replace	Replace 400W MV Lamps	54	67.11	6/4/67	932,000	100,00	3.37	3.00
/ Install Co	Install Ceiling Mounted PIR Occupancy	066	000	162 012	162 073   \$114 606	670 611	1 44	0 23
Sensors	Sensors to Control Lights	523	0.00	102,312	9114,000	110/6/6	<b>†</b>	0.33
V.3 Install W	Install Wall Switch Type PIR Occupancy	162	000	2E 13B	606 3C3	\$17 870	1 42	0.43
Sensors	Sensors to Control Lights	102	0.00	33,130	650,039	670'/16	74.1	0.43
Total Successful Liv	Total Successful Linhting Eigeura and Controls Betrofits	3 400	123 62	562 417	4565 820 4251 336	¢251 336	200	F 34
i ora occession E	Similar interest controls negotics	2,700	153.02	302,717	4303,023	V£31,330	4.50	F 0.0

Table 2. Lighting Retrofit A: Exit Light LED Retrofit

Bldg No	Room No	No of Fixtures	ECO Savings (kW)	ECO Savings (kWH/Yr)	ECO Rebate (\$)	ECO Investment (\$)	ECO Total Savings (\$/Year)	ECO LCC Savings (\$)
15544	111	3	0.055	477	\$27	\$151	\$25	\$308
43002	1 A	3	0.055	477	\$27	\$151	\$25	\$306
43002	1st Floor	2	0.036	318	\$18	\$101	\$17	\$204
43002	2 C	2	0.036	318	\$18	\$101	\$17	\$204
43002	Basement	1	0.018	159	\$9	<b>\$50</b>	\$8	\$102
53301	103	2	0.036	318	\$18	\$101	\$17	\$204
53301	202	4	0.073	636	\$36	\$201	\$34	\$408
53301	217	2	0.036	318	\$18	\$101	\$17	\$204
53301	ENTRY	3	0.055	477	\$27	\$151	\$25	\$306
53301	STAIR	2	0.036	318	\$18	\$101	\$17	\$204
53301	STAIR	2	0.036	318	\$18	\$101	\$17	\$204
56301	Exit Signs	10	0.182	1,590	\$90	\$503	\$85	\$1,021
57428	•	15	0.273	2,385	\$135	\$755	\$127	\$1,531
61701	Corridor	1	0.018	159	\$9	\$50	\$8	\$102
61701	Corridor	5	0.091	795	\$45	\$252	\$42	\$510
61701	Main Corridor	1	0.018	159	\$9	\$50	\$8	\$102
61701	Pool	1	0.018	159	<b>\$9</b>	\$50	\$8	\$102
61701	Pool Lobby	1	0.018	159	<b>\$9</b>	\$50	\$8	\$102
62704	-	17	0.309	2,703	\$153	\$856	\$144	\$1,735
70525	Dining	1	0.018	159	\$9	\$50	\$8	\$102
70525	Dining	3	0.055	477	\$27	\$151	\$25	\$306
70525	Kitchen	1	0.018	159	\$9	\$50	\$8	\$102
70525	Kitchen	2	0.036	318	\$18	\$101	\$17	\$204
80305	101	1	0.018	159	\$9	\$50	\$8	\$102
80305	102	1	0.018	159	<b>\$</b> 9	\$50	\$8	\$102
80305	105	1	0.018	159	\$9	\$50	\$8	\$102
80305	107	1	0.018	159	\$9	\$50	\$8	\$102
80305	108	2	0.036	318	\$18	\$101	\$17	\$204
80305	116	2	0.036	318	\$18	\$101	\$17	\$204
80305	177	2	0.036	318	\$18	\$101	\$17	\$204
80305	212	2	0.036	318	\$18	\$101	\$17	\$204
80305	213	2	0.036	318	\$18	\$101	\$17	\$204
80305	312	2	0.036	318	\$18	\$101	\$17	\$204
80305	313	2	0.036	318	\$18	\$101	\$17	\$204
80305	OR	1	0.018	159	\$9	\$50	\$8	\$102
91114	1st E Battery Shop	1	0.018	159	\$9	\$50	\$8	\$102
91114	1st E Stairs	1	0.018	159	\$9	\$50	\$8	\$102
91114	1st Hangar	2	0.036	318	\$18	\$101	\$17	\$204
91114	1st W Stairs	1	0.018	159	\$9	\$50	\$8	\$102
otals for R	letrofit Type A:	108	1.966	17,171	\$972	\$5,438	\$916	\$11,025
	* <del>-</del>			•	SIR	2.03	Payback	5.94

Table 3. Lighting Retrofit B2 F30T12, 2 Lamp Fixtures:
Replace Existing Lamps and Ballasts

		neplace	_		ina Ballas			
			ECO	ECO		ECO	ECO Total	ECO LCC
		No of	Savings	Savings	ECO	Investment	Savings	Savings
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	(\$)
80305	117	1	0.030	66	\$10	\$44	\$8	\$94
80305	119	1	0.030	66	\$10	\$44	\$8	\$94
80305	120	1	0.030	66	\$10	\$44	\$8	\$94
80305	122	1	0.030	66	\$10	\$44	\$8	\$94
80305	123	1	0.030	66	\$10	\$44	\$8	\$94
80305	125	1	0.030	66	\$10	\$44	\$8	\$94
80305	126	1	0.030	66	\$10	\$44	\$8	\$94
80305	128	1	0.030	66	\$10	\$44	\$8	\$94
80305	130	1	0.030	66	\$10	\$44	\$8	\$94
80305	131	1	0.030	66	\$10	\$44	\$8	\$94
80305	132	1	0.030	66	\$10	\$44	\$8	\$94
80305	134	1	0.030	66	\$10	\$44	\$8	\$94
80305	135	1	0.030	66	\$10	\$44	\$8	\$94
80305	137	1	0.030	66	\$10	\$44	\$8	\$94
80305	138	1	0.030	66	\$10	\$44	\$8	\$94
80305	140	1	0.030	66	\$10	\$44	\$8	\$94
80305	141	1	0.030	66	\$10	\$44	\$8	\$94
80305	143	1	0.030	66	\$10	\$44	\$8	\$94
80305	144	1	0.030	66	\$10	\$44	\$8	\$94
80305	146	1	0.030	66	\$10	\$44	\$8	\$94
80305	147	1	0.030	66	\$10	\$44	\$8	\$94
80305	148	1	0.030	66	\$10	\$44	\$8	\$94
80305	150	1	0.030	66	\$10	\$44	\$8	\$94
80305	151	1	0.030	66	\$10	\$44	\$8	\$94
80305	153	1	0.030	66	\$10	\$44	\$8	\$94
80305	155	1	0.030	66	\$10	\$44	\$8	\$94
80305	156	1	0.030	66	\$10	\$44	\$8	\$94
80305	158	1	0.030	66	\$10	\$44	\$8	\$94
80305	159	1	0.030	66	\$10	\$44	\$8	\$94
80305	160	1	0.030	66	\$10	\$44	\$8	\$94
80305	162	1	0.030	66	\$10	\$44	\$8	\$94
80305	164	1	0.030	66	\$10	\$44	\$8	\$94
80305	165	1	0.030	66	\$10	\$44	\$8	\$94
80305	167	1	0.030	66	\$10	\$44	\$8	\$94
80305	168	1	0.030	66	\$10	\$44	\$8	\$94
80305	170	1	0.030	66	\$10	\$44	\$8	\$94
80305	171	1	0.030	66	\$10	\$44	\$8	\$94
80305	173	1	0.030	66	\$10	\$44	\$8	\$94
80305	174	1	0.030	66	\$10	\$44	\$8	\$94
80305	176	1	0.030	66	\$10	\$44	\$8	\$94
80305	208	1	0.030	66	\$10	\$44	\$8	\$94
80305	210	1	0.030	66	\$10	\$44	\$8	\$94
80305	214	1	0.030	66	\$10	\$44	\$8	\$94
80305	216	1	0.030	66	\$10	\$44	\$8	\$94
80305	219	1	0.030	66	\$10	\$44	\$8	\$94
80305	219.1	1	0.030	66	\$10	\$44	\$8	\$94
80305	220	1	0.030	66	\$10	\$44	\$8	\$94
80305	222	1	0.030	66	\$10	\$44	\$8	\$94
80305	223	1	0.030	66	\$10	\$44	\$8	\$94
80305	225	1	0.030	66	\$10	\$44	\$8	\$94
80305	226	1	0.030	66	\$10	\$44	\$8	\$94
80305	228	1	0.030	66	\$10	\$44	\$8	\$94
80305	229	1	0.030	66	\$10	\$44	\$8	\$94
80305	231	1	0.030	66	\$10	\$44	<b>\$8</b>	\$94
80305	232	1	0.030	66	\$10	\$44	<b>\$8</b>	\$94 \$94
80305	234	1	0.030	66	\$10	\$44 \$44	\$6 \$8	\$94 \$94
80305	235	1	0.030	66	\$10 \$10	\$44 \$44	\$8 \$8	\$94 \$94
80305	237	1	0.030	66	\$10 \$10	\$44 \$44	\$8 \$8	\$94 \$94
80305	238	1	0.030	66	\$10 \$10	\$44 \$44		\$94 \$94
80305	240	1	0.030	66	\$10 \$10	\$44 \$44	\$8 40	\$94 \$94
80305	240	1	0.030	66	\$10 \$10		\$8 40	
80305	241	1	0.030	66	\$10 \$10	\$44 \$44	\$8 •°	\$94 40 <i>4</i>
80305	243 244	1	0.030			\$44	<b>\$8</b>	\$94 404
80308	<b>∠44</b>	•	0.030	66	\$10	\$44	\$8	\$94

Table 3. Lighting Retrofit B2 F30T12, 2 Lamp Fixtures:
Replace Existing Lamps and Ballasts

		Replace	Existing	Lamps a	ınd Ballas	its		
			ECO	ECO		ECO	ECO Total	ECO LCC
		No of	Savings	Savings	ECO	Investment	Savings	Savings
Bidg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	(\$)
80305	246	1	0.030	66	\$10	\$44	\$8	\$94
80305	247	1	0.030	66	\$10	\$44	\$8	\$94
80305	249	1	0.030	66	\$10	\$44	\$8	\$94
80305	250	1	0.030	66	\$10	\$44	\$8	\$94
80305	252	1	0.030	66	\$10	\$44	\$8	\$94
80305	253	1	0.030	66	\$10	\$44	\$8	\$94
80305	255	1	0.030	66	\$10	\$44	\$8	\$94
80305	256	1	0.030	66	\$10	\$44	\$8	\$94
80305	258	1	0.030	66	\$10	\$44	\$8	\$94
80305	259	1	0.030	66	\$10	\$44	\$8	\$94
80305	261	1	0.030	66	\$10	\$44	<b>\$8</b>	\$94
80305	264	1	0.030	66	\$10	\$44	\$8	\$94
80305	264.1	1	0.030	66	\$10	\$44	\$8	\$94
80305	265	1	0.030	66	\$10	\$44	\$8	\$94
80305	267	1	0.030	66	\$10	\$44	\$8	\$94
80305	268	1	0.030	66	\$10	\$44	\$8	\$94
80305	270	1	0.030	66	\$10	\$44	\$8	\$94
80305	271	1	0.030	66	\$10	\$44	\$8	\$94
80305	273	1	0.030	66	\$10	\$44	\$8	\$94
80305	308	1	0.030	66	\$10	\$44	\$8	\$94
80305	310	1	0.030	66	\$10	\$44	\$8	\$94
80305	314	1	0.030	66	\$10	\$44	\$8	\$94
80305	316	1	0.030	66	\$10	\$44	\$8	\$94
80305	319	1	0.030	66	\$10	\$44	\$8	\$94
80305	319.1	1	0.030	66	\$10	\$44	\$8	\$94
80305	320	1	0.030	66	\$10	\$44	\$8	\$94
80305	322	1	0.030	66	\$10	\$44	\$8	\$94
80305	323	1	0.030	66	\$10	844	\$8	\$94
80305	325	1	0.030	66	\$10	\$44	\$8	\$94
80305	326	1	0.030	66	\$10	\$44	\$8	\$94
80305	328	1	0.030	66	\$10	\$44	\$8	\$94
80305	329	1	0.030	66	\$10	\$44	\$8	\$94
80305	331	1	0.030	66	\$10	\$44	\$8	\$94
80305	332	1	0.030	66	\$10	\$44	\$8	\$94
80305	334	1	0.030	66	\$10	\$44	\$8	\$94
80305	335	1	0.030	66	\$10	\$44	\$8	\$94
80305	337	1	0.030	66	\$10	\$44	\$8	\$94
80305	338	1	0.030	66	\$10	\$44	\$8	\$94
80305	340	1	0.030	66	\$10	\$44	\$8	\$94
80305	341	1	0.030	66	\$10	\$44	\$8	\$94
80305	343	1	0.030	66	\$10	\$44	\$8	\$94
80305	344	1	0.030	66	\$10	\$44	<b>\$8</b>	\$94
80305	346	1	0.030	66	\$10	\$44	<b>\$8</b>	\$9 <b>4</b>
80305	347	1	0.030	66	\$10	\$44	<b>\$8</b>	\$94
80305	349	1	0.030	66	\$10	\$44	\$8	\$9 <b>4</b>
80305	350	i	0.030	66	\$10	\$44	<b>\$8</b>	\$9 <b>4</b>
80305	352	1	0.030	66	\$10	\$44	\$8	\$94
80305	353	1	0.030	66	\$10	\$44	\$8	\$94
80305	355	1	0.030	66	\$10	\$44	<b>\$8</b>	\$94
80305	356	1	0.030	66	\$10	\$44	\$8	\$9 <b>4</b>
80305	358	1	0.030	66	\$10	\$44	<b>\$8</b>	\$94
80305	359	1	0.030	66	\$10	\$44	\$8	\$94
80305	361	1	0.030	66	\$10	\$44	\$8	\$94
80305	364	1	0.030	66	\$10	\$44	<b>\$8</b>	\$94
80305	364.1	1	0.030	66	\$10	\$44 \$44	\$8	\$94 \$94
80305	365	1	0.030	66	\$10	\$44 \$44	\$8	\$94 \$94
80305	367	1	0.030	66	\$10 \$10	\$44 \$44	\$8	\$94 \$94
80305	368	1	0.030	66	\$10 \$10	\$44 \$44	\$8	\$94 \$94
80305	370	1	0.030	66	\$10	\$44 \$44	\$8	\$94 \$94
80305	371	1	0.030	66	\$10	\$44 \$44	\$8	\$94 \$94
80305	373	1	0.030	66	\$10 \$10	\$44 \$44	\$6 \$8	\$94 \$94
	Retrofit Typ	124	3.720	8,124	\$1,240	\$5,502	\$973	\$11,682
	тур	7	U., 20	5,124	SIR	2.12	Payback	5.66
					om	د. ۱ د	rayback	5.56

Table 4. Lighting Retrofit D1 F34T12 and F40T12, 1 Lamp Fixtures:

Replace Lamps and Ballasts

		•						
			ECO	ECO		ECO	ECO Total	ECO LCC
		No of	Savings	Savings	ECO	Investment	Savings	Savings
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	(\$)
22422	Basement	1	0.019	30	\$5	\$43	\$4	\$48
22422	Basement	1	0.019	30	\$9	\$43	\$7	\$85
43002	1st Floor	9	0.171	267	<b>\$81</b>	\$391	\$28	\$342
43002	1st Floor	3	0.057	178	\$27	\$130	\$14	\$171
53301	114	1	0.012	25	\$9	\$43	\$6	\$73
53301	115	3	0.036	150	\$27	\$130	\$13	\$157
53301	115	3	0.036	150	\$27	\$130	\$13	\$157
53301	203	10	0.120	1,048	<b>\$9</b> 0	\$435	\$39	\$474
53301	203	6	0.072	300	<b>\$54</b>	\$261	\$21	\$252
53301	211	5	0.060	524	\$45	\$217	\$21	\$254
53301	214	6	0.072	300	\$54	\$261	\$21	\$252
53301	214	1	0.012	25	\$9	\$43	\$8	\$101
53301	ENTRY	11	0.132	1,153	\$99	\$478	\$46	\$555
53301	STAIR	7	0.084	734	\$63	\$304	\$27	\$331
53301	STAIR	7	0.084	734	\$63	\$304	\$27	\$331
53301	STAIR	10	0.120	1,048	\$90	\$435	\$45	\$540
53301	STAIR	10	0.120	1,048	\$90	\$435	\$40	\$477
57428	112	4	0.076	316	\$36	\$174	\$25	\$300
57428	117	1	0.019	79	\$9	\$43	\$9	\$106
57428	127	1	0.019	166	\$9	\$43	\$14	\$163
61701	Агеа	12	0.228	474	\$108	\$522	\$48	\$578
61701	Locker Rooms	6	0.114	237	\$54	\$261	\$27	\$328
80305	112	1	0.019	10	\$9	\$43	\$7	\$89
80305	307	1	0.019	41	\$9	\$43	\$10	\$121
Totals for R	letrofit Type D1:	120	1.720	9,066	\$1,080	\$5,217	\$522	\$6,286
					SIR	1.20	Payback	9.99

Table 5. Lighting Retrofit D2 F34T12 and F40T12, 2 Lamp Fixtures:

Replace Lamps and Ballasts

		керіасе	Lamps a	nd Ballas	sts			
			ECO	ECO		ECO	ECO Total	
		No of	Savings	Savings	ECO	Investment	Savings	ECO LCC
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	Savings (\$)
15544	107	6	0.150	1,310	<b>\$60</b>	\$288	\$82	\$987
20200	Kitchen	1	0.025	27	\$10	\$48	\$4	\$54
22422	101	4	0.100	250	\$40	\$192	\$25	\$298
22422	102	4	0.100	250	\$40	\$192	\$25	\$298
22422	103	2	0.050	125	\$20	<b>\$96</b>	\$12	\$149
22422	104	2	0.050	125	\$20	\$96	\$12	\$149
22422	107	4	0.100	250	\$40	\$192	\$25	\$298
22422	108	8	0.200	499	\$80	\$384	\$50	<b>\$595</b>
22422	109	2	0.050	125	\$20	\$96	\$12	\$149
22422	110	2	0.050	125	\$20	<b>\$96</b>	\$12	\$149
22422	111	15	0.375	936	\$150	\$720	\$93	\$1,116
22422	112	2	0.050	125	\$20	\$96	\$12	\$149
22422	113	2	0.050	125	\$20	\$96	\$12	\$149
22422	114	2	0.050	125	\$20	\$96	\$12	\$149
22422	115	2	0.050	125	\$20	\$96	\$12	\$149
22422	116	10	0.250	624	\$100	\$480	\$62	\$744
22422	201	4	0.100	250	\$40	\$192	\$25	\$298
22422	202	4	0.100	250	\$40	\$192	\$25	\$298
22422	203	8	0.200	499	\$80	\$384	\$50	\$595
22422	204	2	0.050	125	\$20	\$96	\$12	\$149
22422	205	28	0.700	1,747	\$280	\$1,344	\$173	\$2,083
22422	206	2	0.050	125	\$20	\$96	\$12	\$149
22422	207	2	0.050	125	\$20	\$96	\$12	\$149
22422	208	4	0.100	250	\$40	\$192	\$25	\$298
22422	209	2	0.050	125	\$20	<b>\$96</b>	\$12	\$149
22422	210	2	0.050	125	\$20	\$96	\$12	\$149
22422	108A	4	0.100	250	\$40	\$192	\$25	\$298
22422	Basement	2	0.050	437	\$20	<b>\$96</b>	\$27	\$329
22422	Basement	2	0.050	78	\$20	<b>\$96</b>	\$10	\$122
22422 22422	Basement	2 1	0.050	78	\$20	\$96	\$10	\$122
22422	Basement PS1	1 5	0.025	13	\$10 450	\$48	\$4	\$46
43002	1 D	2	0.125 0.050	312	\$50 \$30	\$240	\$31	\$372
43002	1 E	2	0.050	125 13	\$20 \$20	\$96 \$96	\$1 <u>2</u> \$7	\$149
43002	1 F/G	3	0.030	187	\$20 \$30	\$144	\$ / \$ 19	\$84 *222
43002	1 H	3	0.075	20	\$30	\$144 \$144	\$15 \$11	\$223 \$126
43002	1st Floor	8	0.200	1,248	\$80	\$384	\$86	\$1,028
43002	1st Floor	5	0.125	390	\$50	\$240	\$35	\$417
43002	1st Floor	1	0.025	62	\$10	\$48	\$6	\$74
43002	1st Floor	i	0.025	62	\$10	\$48	\$6	\$74
43002	1st Floor	2	0.050	125	\$20	\$96	\$12	\$149
43002	1st Floor	2	0.050	125	\$20	<b>\$96</b>	\$12	\$149
43002	1st Floor	2	0.050	125	\$20	\$96	\$12	\$149
43002	1st Floor	2	0.050	158	\$20	\$96	\$14	\$167
43002	1st Floor	2	0.050	156	\$20	\$96	\$14	\$167
43002	1st Floor	1	0.025	7	\$10	\$48	\$4	\$42
43002	2 Balcony A	8	0.200	52	\$80	\$384	\$28	\$337
43002	2 Balcony B	8	0.200	52	\$80	\$384	\$28	\$337
43002	2 C	6	0.150	374	\$60	\$288	\$37	\$446
43002	2 D	2	0.050	125	\$20	\$96	\$12	\$149
43002	2 E	1	0.025	156	\$10	\$48	\$11	\$128
43002	2 F	1	0.025	156	\$10	\$48	\$11	\$128
43002	Basement	1	0.025	156	\$10	\$48	\$11	\$128
43002	Basement	2	0.050	13	\$20	\$96	\$7	\$84
43002	Basement	2	0.050	125	\$20	\$96	\$12	\$149
53301	103	113	1.243	5,171	\$1,130	\$5,422	\$405	\$4,870
53301	109	5	0.055	114	\$50	\$240	\$12	\$149
53301	117	6	0.066	275	\$60	\$288	\$22	\$259
53301	119	29	0.319	1,327	\$290	\$1,392	\$104	\$1,250
53301	120	13	0.143	595	\$130	\$624	\$47	\$560
53301	124	31	0.341	1,419	\$310	\$1,488	\$111	\$1,336
53301	127	2	0.022	92	\$20	\$96	\$7	\$86
53301	128	8	0.088	366	\$80	\$384	\$29	\$345

Table 5. Lighting Retrofit D2 F34T12 and F40T12, 2 Lamp Fixtures:

Replace Lamps and Ballasts

		керіасе	Lamps a	nd Ballas	its			
			ECO	ECO		ECO	ECO Total	
		No of	Savings	Savings	ECO	Investment	Savings	ECO LCC
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	Savings (\$)
56301	114	4	0.044	165	\$40	\$192	\$13	\$162
56301	115	20	0.220	824	\$200	\$960	\$67	\$810
56301	116	4	0.044	165	\$40	\$192	\$13	\$162
56301	117	3	0.033	124	\$30	\$144	\$10	\$121
56301	118	16	0.176	659	\$160	\$768	\$54	\$648
56301	119	2	0.022	82	\$20	\$96	\$7	\$81
56301	120	4	0.044	165	\$40	\$192	\$13	\$162
56301	121	24	0.264	988	\$240	\$1,152	\$81	\$972
56301	122	2	0.022	82	\$20	\$96	\$7	\$81
56301	130	2	0.022	82	\$20	\$96	\$7	\$81
56301	147	3	0.033	124	\$30	\$144	\$10	\$121
56301	148	2	0.022	82	\$20	\$96	\$7	<b>\$81</b>
56301	130, Lab	12	0.132	494	\$120	\$576	\$40	\$486
56301	153A	8	0.088	329	\$80	\$384	\$27	\$324
56301	Conr	3	0.033	288	\$30	\$144	\$18	\$216
56301	Conr	5	0.055	480	\$50	\$240	\$30	\$360
56301	Conr 1	10	0.110	961	\$100	\$480	\$60	\$719
56301	Conr Cross	2	0.022	192	\$20	\$96	\$12	\$144
57428	102	2	0.050	104	\$20	\$96	\$11	\$136
57428	112	2	0.050	437	\$20	\$96	\$27	\$329
57428	112	2	0.050	437	\$20	\$96	\$27	\$329
57428	112	2	0.050	437	\$20	\$96	\$27	\$329
57428	112	3	0.075	655	\$30	\$144	\$41	\$494
57428	112	6	0.150	1,310	\$60	\$288	\$82	\$987
57428	210	2	0.050	437	\$20	\$96	\$27	\$329
61701	Corridor	1	0.025	130	\$10	\$48	\$9	\$113
61701	Corridor	2	0.050	260	\$20	<b>\$96</b>	\$19	\$227
81701	Corridor	2	0.050	260	\$20	<b>\$96</b>	\$19	\$227
61701	Corridor	3	0.035	390	\$30	\$144	\$28	\$340
61701	Corridor	4	0.100	520	\$40	\$192	\$38	\$454
61701	Corridor	9	0.100	1,170	\$90	\$432	\$85	\$1,021
61701	Locker Rooms	90	2.250	4,680	\$900	\$4,319	\$512	\$6,159
61701	Main Corridor	9	0.225	1,170	\$90	\$432	\$85	\$1,021
61701	Office	2	0.050	1,170	\$20	\$96	\$11	\$137
61701	Office	3	0.075	156	\$30	\$144	\$17	\$205
61701	Office	12	0.300	624	\$120	\$576	\$68	\$821
61701	Pool	12	0.300	624	\$120		\$68	\$821
61701	Pool Lobby	9	0.225	1,170	\$120	\$576 \$433	\$85	\$1,021
61701	Pool Office	2		1,170		\$432 \$96	\$65 \$11	•
			0.050		\$20			\$137 4104
61701	Supplies	4	0.100	52	\$40 420	\$192	\$15 417	\$184 400E
61701	Toilet	3	0.075	156	\$30	\$144	\$17	\$205 4205
61701	Toilet	3	0.075	156	\$30	\$144	\$17	\$205 \$501
62704 62704	•	6	0.150	468	\$60	\$288	\$42	
	•	4	0.100	234	\$40	\$192	\$24	\$288
62704	-	7	0.175	410	\$70	\$336	\$42	\$505 4004
62704	W11	10	0.250	780	\$100	\$480	\$69	\$834
70525	Corridor	4	0.100	624	\$40	\$192	\$43	\$514
70525	Corridor	5	0.125	780	\$50	\$240	\$53	<b>\$642</b>
70525	Dishwash	1	0.025	78	\$10	\$48	\$7	\$83
70525	Office	2	0.050	156	\$20	\$96	\$14	\$166
70525	Offices	5	0.125	390	\$50	\$240	<b>\$35</b>	\$416
70525	Offices	10	0.250	780	\$100	\$480	\$69	\$832
70525	Offices	2	0.050	234	\$20	\$96	<b>\$18</b>	\$212
70525	Supply	1	0.025	78	\$10	\$48	\$7	\$83
70525	Toilet	2	0.050	234	\$20	\$96	\$18	\$212
70525	Whse	1	0.025	78	\$10	\$48	\$7	\$83
70525	Whse	4	0.100	312	\$40	\$192	\$28	<b>\$333</b>
80305	101	2	0.050	437	\$20	\$96	\$27	\$329
80305	102	2	0.050	437	\$20	<b>\$96</b>	\$27	\$329
80305	103	4	0.100	520	\$40	\$192	\$38	\$454
80305	104	3	0.075	390	\$30	\$144	\$28	\$340
80305	105	2	0.050	437	\$20	\$96	\$27	\$329
80305	107	1	0.025	218	\$10	\$48	\$14	<b>\$165</b>

Table 5. Lighting Retrofit D2 F34T12 and F40T12, 2 Lamp Fixtures:

Replace Lamps and Ballasts

		neplace	camps a	na banas	its			
			ECO	ECO		ECO	<b>ECO Total</b>	
		No of	Savings	Savings	ECO	Investment	Savings	ECO LCC
_Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	Savings (\$)
80305	108	4	0.100	874	\$4C	\$192	\$55	\$658
80305	109	2	0.050	260	\$20	<b>\$96</b>	\$19	\$227
80305	110	1	0.025	62	\$10	\$48	\$6	\$74
80305	111	1	0.025	175	\$10	\$48	\$12	\$139
80305	113	1	0.025	26	\$10	\$48	\$4	\$53
80305	114	1	0.025	13	\$10	\$48	\$4	\$46
80305	115	2	0.050	52	\$20	<b>\$96</b>	<b>\$9</b>	<b>\$107</b>
80305	116	6	0.150	1,310	<b>\$60</b>	\$288	\$82	\$987
80305	116	1	0.025	55	\$10	\$48	\$6	\$70
80305	117	1	0.025	55	\$10	\$48	\$6	\$70
80305	119	1	0.025	55	\$10	\$48	<b>\$</b> 6	\$70
80305	120	1	0.025	55	\$10	\$48	\$6	\$70
80305	121	1	0.025	55	\$10	\$48	\$6	<b>\$70</b>
80305	122	1	0.025	55	\$10	\$48	\$6	<b>\$70</b>
80305	123	1	0.025	55	\$10	\$48	\$6	\$70
80305	124	1	0.025	55	<b>\$10</b>	\$48	\$6	<b>\$70</b>
80305	125	1	0.025	55	\$10	\$48	\$6	\$70
80305	126	1	0.025	55	\$10	\$48	\$6	\$70
80305	127	1	0.025	55	<b>\$10</b>	\$48	<b>\$6</b>	\$70
80305	128	1	0.025	55	\$10	\$48	\$6	\$70
80305	130	1	0.025	55	\$10	\$48	\$6	\$70
80305	130	1	0.025	55	\$10	\$48	\$6	\$70
80305	131	1	0.025	55	\$10	\$48	\$6	\$70
80305	132	1	0.025	55	\$10	\$48	\$6	\$70
80305	133	1	0.025	55	\$10	\$48	\$6	\$70
80305	134	1	0.025	55	\$10	\$48	\$6	\$70
80305	135	1	0.025	55	\$10	\$48	\$6	\$70
80305	136	1	0.025	55	\$10	\$48	\$6	\$70
80305	137	1	0.025	55	\$10	\$48	\$6	\$70
80305	138	1	0.025	55 55	\$10	\$48	\$6 40	\$70 470
80305	o 139	1 1	0.025	55 55	\$10 \$10	\$48	\$6 46	\$70 470
80305 80305	140 141	1	0.025 0.025	55 55	\$10 \$10	\$48 \$48	\$6 \$6	\$70 \$70
80305	142	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	143	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	144	1	0.025	55 55	\$10	\$48	<b>\$6</b>	\$70 \$70
80305	145	1	0.025	55 55	\$10	\$48	<b>\$6</b>	\$70
80305	146	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	147	1	0.025	55	\$10	\$48	\$6	\$70
80305	148	1	0.025	55	\$10	\$48	<b>\$6</b>	\$70
80305	148	i 1	0.025	55	\$10	\$48	\$6	\$70
80305	150	1	0.025	55	\$10	\$48	\$6	\$70
80305	151	1	0.025	55	\$10	\$48	\$6	\$70
80305	151	1	0.025	55	\$10	\$48	\$6	\$70
80305	153	1	0.025	55	\$10	\$48	\$6	\$70
80305	154	1	0.025	55	\$10	\$48	\$6	\$70
80305	155	1	0.025	55	\$10	\$48	\$6	\$70
80305	156	1	0.025	55	\$10	\$48	\$6	\$70
80305	157	1	0.025	55	\$10	\$48	\$6	\$70
80305	158	1	0.025	55	\$10	\$48	\$6	\$70
80305	159	1	0.025	55	\$10	\$48	\$6	\$70
80305	160	1	0.025	55	\$10	\$48	\$6	\$70
80305	160	1	0.025	55	\$10	\$48	\$6	\$70
80305	162	1	0.025	55	\$10	\$48	\$6	\$70
80305	163	1	0.025	55	\$10	\$48	\$6	\$70
80305	164	1	0.025	55	\$10	\$48	\$6	\$70
80305	165	1	0.025	55	\$10	\$48	\$6	\$70
80305	166	1	0.025	55	\$10	\$48	\$6	\$70
80305	167	1	0.025	55	\$10	\$48	\$6	\$70
80305	168	1	0.025	55	\$10	\$48	\$6	\$70
80305	169	1	0.025	55	\$10	\$48	\$6	\$70
80305	170	1	0.025	55	\$10	\$48	\$6	\$70
80305	171	1	0.025	55	\$10	\$48	\$6	\$70

Table 5. Lighting Retrofit D2 F34T12 and F40T12, 2 Lamp Fixtures:
Replace Lamps and Ballasts

		ricpiace	FOO.	FOO.		F00	500 T	
		No6	ECO	ECO	500	ECO	ECO Total	
Old m No	Danie Na	No of	Savings	Savings	ECO	Investment	Savings	ECO LCC
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	Savings (\$)
80305	172	1	0.025	55	\$10	\$48	\$3.	\$70
80305	173	1	0.025	55	\$10	\$48	\$6	\$70
80305	174	1	0.025	55	\$10	\$48	\$6	\$70
80305	175	1	0.025	55	\$10	\$48	\$6	\$70
80305	176	1	0.025	55	\$10	\$48	\$6	\$70
80305	177	5	0.125	1,092	\$50	\$240	\$68	\$823
80305	200	1	0.025	218	\$10	\$48	\$14	\$165
80305	200	8	0.200	1,747	\$80	\$384	\$109	\$1,316
80305	201	2	0.050	125	\$20	\$96	\$12	\$149
80305	202	1	0.025	13	\$10	\$48	\$4	\$46
80305	203	4	0.100	520	\$40	\$192	\$38	\$454
80305	204	1	0.025	62	\$10	\$48	\$6	\$74
80305	205	3	0.075	655	\$30	\$144	\$41	\$494
80305	206	1	0.025	218	\$10	\$48	\$14	\$165
80305	206.1	1	0.025	218	\$10	\$48	\$14	\$165
80305	208	4	0.100	250	\$40	\$192	\$25	\$298
80305	208	1	0.025	55	\$10	\$48	\$6	\$70
80305	208	6	0.150	780	\$60	\$288	\$57	\$681
80305	210	1	0.025	55	\$10	\$48	\$6	\$70
80305	210	1	0.025	55	\$10	\$48	\$6	\$70
80305	212	6	0.150	1,310	\$60	\$288	\$82	\$987
80305	213	5	0.125	1,092	<b>\$50</b>	\$240	\$68	\$823
80305	214	1	0.025	55	\$10	\$48	\$6	\$70
80305	215	1	0.025	55	\$10	\$48	\$6	\$70
80305	216	1	0.025	55	\$10	\$48	\$6	\$70 470
80305	218	1	0.025	55	\$10	\$48 *40	\$6	\$70 470
80305	219	1	0.025	55	\$10	\$48 440	\$6	\$70 470
80305	219.1	1	0.025	55	\$10	\$48	\$6	\$70
80305	220	1	0.025	55	\$10	\$48	\$6	\$70 470
80305	221	1	0.025	55	\$10	\$48	\$6	\$70 470
80305	222	1	0.025	55	\$10	\$48	\$8	\$70
80305 80305	223 224	1	0.025	55	\$10	\$48	\$6	\$70 470
80305 80305		1 1	0.025	55	\$10	\$48	\$6	\$70 470
80305	225 226	1	0.025	55 55	\$10 \$10	\$48 \$48	\$6 \$6	\$70 \$70
80305	227	1	0.025 0.025	55 55	\$10 410	\$48 448	\$6	\$70 470
80305	228	1	0.025	55 55	\$10 \$10	\$48 \$48	\$6	\$70 \$70
80305	229	1	0.025	55 55	\$10 \$10	\$48	\$6	\$70 \$70
80305	230	1	0.025	55 55	\$10	\$48	<b>\$6</b>	\$70 \$70
80305	231	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	232	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	233	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	234	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	235	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	236	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	237	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	238	i	0.025	55 55	\$10	\$48	<b>\$6</b>	\$70
80305	239	i	0.025	55 55	\$10	\$48	<b>\$</b> 6	\$70
80305	240	i	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	241	1	0.025	55 55	\$10	\$48	<b>\$</b> 6	\$70
80305	242	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	243	i	0.025	55	\$10	\$48	\$6	\$70
80305	244	1	0.025	55	\$10	\$48	\$6	\$70
80305	245	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	246	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	247	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	248	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	249	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	250	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	251	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	252	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	253	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	254	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
50500	407	•	0.020	ບບ	410	440	40	470

Table 5. Lighting Retrofit D2 F34T12 and F40T12, 2 Lamp Fixtures:

Replace Lamps and Ballasts

		Replace	Lamps a	nd Ballas	its			
			ECO	ECO		ECO	ECO Total	
		No of	Savings	Savings	ECO	Investment	Savings	ECO LCC
Bidg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	Savings (\$)
80305	255	1	0.025	55	\$10	\$48	\$6	\$70
80305	256	1	0.025	55	\$10	\$48	\$6	\$70
80305	257	1	0.025	55 55	\$10	\$48	\$6	\$70
80305	258	1 1	0.025	55 55	\$10 \$10	\$48 449	\$6 48	\$70 \$70
80305 80305	259 260	1	0.025 0.025	55 55	\$10 \$10	\$48 \$48	\$6 \$6	\$70 \$70
80305	261	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	263	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	264	1	0.025	55	\$10	\$48	\$6	\$70
80305	264.1	1	0.025	55	\$10	\$48	\$6	\$70
80305	265	1	0.025	55	\$10	\$48	\$6	\$70
80305	266	1	0.025	55	\$10	\$48	\$6	\$70
80305	267	1	0.025	55	\$10	\$48	\$6	\$70
80305	268	1	0.025	55	\$10	\$48	\$6	\$70
80305	269	1	0.025	55	\$10	\$48	\$6	\$70
80305	270	1	0.025	55	\$10	\$48	\$6	\$70
80305	271	1	0.025	55	\$10	\$48	\$6	\$70
80305	272	1	0.025	55	\$10	\$48	\$6	\$70
80305	273	1	0.025	55	\$10	\$48	\$6	\$70
80305	300	1	0.025	218	\$10	\$48	\$14	\$165
80305	300	8	0.200	1,747	\$80	\$384	\$109	\$1,316
80305	301	2	0.050	125	\$20	\$96 440	\$12	\$149
80305 80305	302 303	1 4	0.025 0.100	13 166	\$10 \$40	\$48 4102	\$4 \$21	\$46 4250
80305	303	4	0.100	520	\$40 \$40	\$192 \$192	\$21 \$38	\$250 \$454
80305	304	1	0.100	62	\$10	\$48	\$6	\$74
80305	305	3	0.075	655	\$30	\$144	\$41	\$494
80305	305	3	0.075	655	\$30	\$144	\$41	\$494
80305	306	1	0.025	218	\$10	\$48	\$14	\$165
80305	306.1	1	0.025	218	\$10	\$48	\$14	\$165
80305	308	4	0.100	250	\$40	\$192	\$25	\$298
80305	308	1	0.025	55	\$10	\$48	\$6	\$70
80305	310	1	0.025	55	\$10	\$48	\$6	\$70
80305	310	1	0.025	55	\$10	\$48	\$6	\$70
80305	312	6	0.150	1,310	\$6O	\$288	\$82	\$987
80305	313	5	0.125	1,092	\$50	\$240	\$68	<b>\$823</b>
80305	314	1	0.025	55	\$10	\$48	\$6	\$70
80305	315	1	0.025	55	\$10	\$48	\$6	\$70
80305	316	1	0.025	55	\$10	\$48	\$6	\$70 470
80305 80305	318 319	1 1	0.025 0.025	55 55	\$10 \$10	\$48 \$48	\$6 \$6	\$70 \$70
80305	319.1	1	0.025	55	\$10 \$10	\$48 \$48	\$6	\$70 \$70
80305	320	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	321	i	0.025	55 55	\$10	\$48	\$6	\$70
80305	322	1	0.025	55	\$10	\$48	\$6	\$70
80305	323	1	0.025	55	\$10	\$48	\$6	\$70
80305	324	1	0.025	55	\$10	\$48	\$6	\$70
80305	325	1	0.025	55	\$10	\$48	\$6	\$70
80305	326	1	0.025	55	\$10	\$48	\$6	\$70
80305	327	1	0.025	55	\$10	\$48	\$6	\$70
80305	328	1	0.025	55	\$10	\$48	\$6	\$70
80305	329	1	0.025	55	\$10	\$48	\$6	<b>\$70</b>
80305	330	1	0.025	55	\$10	\$48	<b>\$6</b>	\$70
80305	331	1	0.025	55	\$10	\$48	\$6	\$70
80305	332	1	0.025	55	\$10	\$48	\$6	\$70 470
80305	333	1	0.025	55	\$10	\$48	\$6 40	\$70 470
80305	334	1	0.025	55 55	\$10 410	\$48 448	\$6 46	\$70 \$70
80305 80305	335 336	1	0.025 0.025	55 55	\$10 \$10	\$48 \$48	\$6 46	\$70 \$70
80305 80305	336 337	1 1	0.025	55 55	\$10 \$10	\$48 \$48	\$6 \$6	\$70 \$70
80305 80305	337	1	0.025	55 55	\$10 \$10	\$48 \$48	\$6 \$6	\$70 \$70
80305	339	1	0.025	55 55	\$ 10 \$ 10	\$48	\$6	\$70 \$70
80305	340	1	0.025	55 55	\$10	\$48	<b>\$6</b>	\$70 \$70
30300	540	•	0.020	55	410	470	40	4,0

Table 5. Lighting Retrofit D2 F34T12 and F40T12, 2 Lamp Fixtures:

Replace Lamps and Ballasts

		neplace	raiiips a		113			
			ECO	ECO		ECO	ECO Total	
		No of	Savings	Savings	ECO	Investment	Savings	ECO LCC
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	Savings (\$)
80305	341	1	0.025	55	\$10	\$48	\$6	\$7C
80305	342	1	0.025	55	\$10	\$48	\$6	\$70
80305	343	1	0.025	55	\$10	\$48	\$6	\$70
80305	344	1	0.025	55	\$10	\$48	\$6	\$70
80305	345	1	0.025	55	\$10	\$48	\$6	\$70
80305	346	1	0.025	55	\$10	\$48	\$6	\$70
80305	347	1	0.025	55	\$10	\$48	\$6	\$70 \$70
80305	348	1	0.025	55	\$10	\$48	\$6	\$70
80305	349	1	0.025	55	\$10	\$48	\$6	\$70
80305	350	1	0.025	55	\$10	\$48	\$6	\$70
80305	351	i	0.025	55	\$10	\$48	\$6	\$70
80305	352	i	0.025	55	\$10	\$48	\$6	\$70
80305	353	i	0.025	55 55	\$10	\$48	<b>\$6</b>	\$70 \$70
80305	354	1	0.025	55 55	\$10	\$48	\$6	\$70 \$70
80305	355	1	0.025	55 55	\$10	\$48	\$6	
80305	356	1	0.025	55 55	\$10			\$70 470
80305	357	1				\$48 440	\$6	\$70
	35 <i>7</i> 358		0.025	55	\$10	\$48	\$6	\$70
80305		1	0.025	55	\$10	\$48	\$6	\$70
80305	359	1	0.025	55	\$10	\$48	\$6	<b>\$</b> 70
80305	360	1	0.025	55	\$10	\$48	\$6	\$70
80305	361	1	0.025	55	\$10	\$48	\$6	\$70
80305	363	1	0.025	55	\$10	\$48	\$6	\$70
80305	364	1	0.025	55	\$10	\$48	\$6	\$70
80305	364.1	1	0.025	55	\$10	\$48	\$6	\$70
80305	365	1	0.025	55	\$10	\$48	\$6	\$70
80305 80305	366 367	1	0.025	5 <b>5</b>	\$10	\$48	<b>\$6</b>	\$70 470
80305	368	1	0.025	55 55	\$10	\$48	\$6	\$70 470
80305	369	1 1	0.025	55 55	\$10 410	\$48 448	<b>\$6</b>	\$70
	370	1	0.025	55 55	\$10	\$48 448	\$6	\$70 470
80305 80305	370 371		0.025	55 55	\$10 \$10	\$48	\$6 46	\$70 470
		1 1	0.025	55	\$10	\$48	\$6	\$70 470
80305 80305	372 373	1	0.025	55 55	\$10 410	\$48	\$6	<b>\$</b> 70
80305		5	0.025	55	\$10 450	\$48	\$6	\$70
80305	Entry Stairs A	6	0.125	1,092	\$50 \$60	\$240	\$68	\$823
80305	Stairs B	6	0.150 0.150	1,310 1,310	\$60 460	\$288	\$82 \$82	\$987 ************************************
80305	Stairs C	6			\$60 \$60	\$288		\$987 *087
			0.150	1,310	\$60	\$288	\$82	\$987
80305	Vestibles	4	0.100	874	\$40	\$192	\$55	\$658
80505 90312	118A Toilet	24 3	0.264	618	\$240	\$1,152	\$63 447	\$758
90312	Toilet	3	0.075	156	\$30 \$30	\$144	\$17	\$205 \$205
90507	Office	4	0.075	156	\$30	\$144	\$17	\$205
			0.100	166	\$40	\$192	\$21	\$250
90507	Office	9	0.225	374	\$90 400	\$432	\$47	\$5 <b>6</b> 2
90507 90507	Toilet Toilet	2 2	0.050 0.050	104 104	\$20	<b>\$96</b>	\$11	\$137
90508	508	10			\$20	\$96 4480	\$11	\$137
		9	0.250	65 03 <i>6</i>	\$100 400	\$480 4433	\$35 474	\$421 4000
91114 91114	1st E Battery Shop		0.225	936	\$90	\$432 4432	\$74	\$886 4777
	1st E Office	9 2	0.225	749	\$90	\$432	\$65 *46	\$777 4107
91114 91114	1st E Stairs	9	0.050 0.225	208	\$20	\$96	\$16	\$197 4000
	1st W Inst. Shop 1st W Mech. Shop	18		936	\$90 4180	\$432 4084	\$74 4147	\$886 41.772
91114 91114	1st W QC Library	3	0.450	1,872	\$180 \$20	\$864	\$147	\$1,772
91114	•		0.075	156	\$30 \$00	\$144	\$17	\$205
91114	1st W QC Office	9	0.225	749	\$90 400	\$432	\$65	\$777 4000
	1st W Seat Shop	9	0.225	936	\$90 \$20	\$432	\$74	\$886 *107
91114	1st W Stairs	2	0.050	208	\$20 \$20	\$96 *06	\$16 *18	\$197
91114	1st W Stairs	2	0.050	208	\$20	\$96 A40	\$16 ••	\$197 *00
91114 91114	1st W Toilet 1st W Toilet	1 1	0.025 0.025	104 104	\$10 \$10	\$48 \$48	\$8 \$8	\$98 \$98
91114	1st W Toilet	2	0.025	208	\$10	\$48 \$06	\$16	\$98 \$197
91114	1st W Veld, Shop	11	0.050	1,144	\$20 \$110	\$96 \$528	\$10 \$90	\$197 \$1,083
91114	2nd E Acet	6	0.275	499	\$110 \$60	\$528 \$288	\$90 \$43	\$1,083 \$518
91114	2nd E Admin	6	0.150	499	\$60 \$60	\$288	\$43 \$43	\$518
91114	2nd E Admin	9	0.130	749	\$90	\$432	\$43 \$65	\$777
31114	ZING E CITIES	3	U.ZZ3	/48	430	443Z	400	4///

Table 5. Lighting Retrofit D2 F34T12 and F40T12, 2 Lamp Fixtures:

Replace Lamps and Ballasts

			ECO	ECO		ECO	ECO Total	
		No of	Savings	Savings	ECO	Investment	Savings	ECO LCC
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	Savings (\$)
91114	2rid EGM	6	0.150	493	\$60	\$288	\$43	\$518
91114	2nd E Key Punch	6	0.150	499	\$60	\$288	\$43	<b>\$518</b>
91114	2nd E Office	3	0.075	250	\$30	\$144	\$22	\$259
91114	2nd E Office	6	0.150	499	\$60	\$288	\$43	\$518
91114	2nd E OP Mgr	6	0.150	499	\$60	\$288	\$43	<b>\$518</b>
91114	2nd E PLT	6	0.150	499	\$60	\$288	\$43	\$518
91114	2nd EQC	6	0.150	499	\$60	\$288	\$43	\$518
91114	2nd E Supply Admin	6	0.150	499	\$60	\$288	\$43	\$518
91114	2nd E Supply Spec	2	0.050	156	\$20	\$96	\$14	\$167
91114	2nd E Toilet	2	0.050	208	\$20	\$96	\$16	\$197
91114	2nd E Toilet	2	0.050	208	\$20	\$96	\$16	\$197
91114	2nd W Corridor	5	0.125	520	<b>\$</b> 50	\$240	\$41	\$492
91114	2nd W Elec. Repair	10	0.250	832	\$100	\$480	\$72	\$864
91114	2nd W Elec. Repair	2	0.050	208	\$20	\$96	\$16	\$197
91114	2nd W Elec. Repair	7	0.175	728	\$70	\$336	\$57	\$689
91114	2nd W Elec. Repair	10	0.250	520	\$100	\$480	\$57	\$682
91114	2nd W Storage	19	0.475	988	\$190	\$912	\$108	\$1,297
Totals for R	letrofit Type D2:	1401	30.027	107,700	\$14,010	\$67,229	\$8,998	\$108,164
					SIR	1.61	Payback	7.47

Table 6. Lighting Retrofit D5 F34T12 and F40T12, 4 Lamp Fixtures: Delamp to 3 F32T8 Lamps and Electronic Ballass with Reflectors

	-	-	ECO	ECO		ECO	ECO Total	
		No of	Savings	Savings	ECO	Investment	Savings	ECO LCC
Bidg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	Savings (\$)
15544	103	16	1.284	3,615	\$304	\$1,038	\$346	\$4,160
15544	104	22	1.738	3,728	\$418	\$1,427	\$416	\$4,997
15544	105	34	2.686	5,761	\$646	\$2,206	\$643	\$7,723
15544	106	21	1.659	4,745	\$399	\$1,362	\$454	\$5,460
15544	107	38	3.002	8,586	\$722	\$2,465	\$822	\$9,879
15544	111	31	2.449	7,004	<b>\$589</b>	\$2,011	\$671	\$8,060
15544	113	28	2.212	6,326	\$532	\$1,817	\$606	\$7,280
15544	114	21	1.659	3,559	<b>\$399</b>	\$1,362	\$397	\$4,770
15544	103A	4	0.316	904	<b>\$</b> 76	\$260	\$87	\$1,040
43002	1 D	4	0.316	789	\$76	\$260	\$81	\$976
43002	1st Floor	4	0.316	986	\$76	\$260	\$91	\$1,090
43002	1st Floor	8	0.632	1,972	\$152	\$519	\$181	\$2,181
43002	Basement	2	0.158	41	\$38	\$130	\$23	\$272
53301	202	122	6.222	25,884	\$2,318	\$7,915	\$2,155	\$25,896
53301	203	3	0.153	636	\$57	\$195	\$53	\$637
53301	204	3	0.153	636	\$57	\$195	\$53	\$637
53301	206	3	0.153	636	\$57	\$195	\$53	\$637
57428	130	31	2.449	10,188	\$589	\$2,011	\$833	\$10,012
57428	131	12	0.948	3,944	\$228	\$779	\$323	\$3,876
61701	Sports Admin.	1	0.079	164	\$19	\$65	\$18	\$222
62704	W10	14	1.106	2,588	\$266	\$908	\$276	\$3,315
62704	W11	14	1.106	2,588	\$266	\$908	\$276	\$3,315
62704	W2	14	1.106	2,588	\$266	\$908	\$276	\$3,315
62704	W3	18	1.422	3,327	\$342	\$1,168	\$355	\$4,262
62704	W4	2	0.158	493	\$38	\$130	\$45	\$545
62704	W4	14	1.106	2,588	\$266	\$908	\$276	\$3,315
62704	W5	14	1.106	2,588	\$266	\$908	\$276	\$3,315
62704	W6	14	1.106	2,588	\$266	\$908	\$276	\$3,315
62704	W7	14	1.106	2,588	\$266	\$908	\$276	\$3,315
62704	M8	14	1.106	2,588	\$266	\$908	\$276	\$3,315
62704	W9	14	1.106	2,588	\$266	\$908	\$276	\$3,315
62704		18	1.422	3,327	\$342	\$1,168	\$355	\$4,262
70525	Bar	6	0.474	1,479	\$114	\$389	\$140	\$1,683
70525	Dining	5	0.395	1,232	<b>\$95</b>	\$324	\$117	\$1,403
70525	Dishwash	1	0.079	370	\$19	\$65	\$29	\$352
70525	Dishwash	8	0.632	2,958	\$152	\$519	\$234	\$2,817
70525	Kitchen	30	2.370	11,092	\$570	\$1,946	\$879	\$10,565
70525	Serving	2	0.158	493	\$38	\$130	\$47	\$561
90312	Office	6	0.474	789	\$114	\$389	\$101	\$1,219
90312	Office	8	0.632	1,052	\$152	\$519	\$135	\$1,625
90312	Office	8	0.632	1,052	\$152 \$152	\$519	\$135	\$1,625
90312	Office	8	0.632	1,052	\$152 \$152	\$519	\$135	\$1,625
90312	Office	10	0.790	1,315	\$192 \$190	\$649	\$169	\$1,025
90507	Office	1	0.790	131	\$190 \$19	\$65	\$109	\$2,031
90507	Office	5	0.395	657	\$95	\$324	\$84	\$203 \$1,015
91114	1st E Battery Shop	1	0.079	329	\$19	\$324 \$65	\$27	\$1,015
	letrofit Type D4:	671	49.341	144,543	\$12,749	\$43,531	\$13,793	\$185,753
I Utans IUI N	iononic type D4;	0/1	70.341	174,043	912,/43	9 <del>4</del> 3,831	Ø13,/83	4100,703

SIR

3.81

Payback

3.16

# Table 7. Lighting Retrofit E1 F48T12HO, 2 Lamp Fixtures: Replace Existing Ballasts with Electronic Ballasts

91114	1st E Tools Retrofit Type E1:	16	0.528 1.584	1,098 <b>5,49</b> 1	\$64 \$192	\$702 \$2.107	\$121 \$468	\$1,450 \$ <b>5.625</b>
91114 91114	2nd W Elec. Repair 1st E Shop	6 24	0.198 0.792	824 3,295	\$24 \$96	\$263 \$1.053	\$65 \$261	\$783 \$3,132
Bldg No 91114	Room No 2nd W Elec. Repair	No of Fixtures	ECO Savings (kW) 0.065	ECO Savings (kWH/Yr) 275	ECO Rebate (\$)	ECO Investment (\$) \$88	Savings (\$/Year) \$22	ECO LCC Savings (\$) \$261

# Table 8. Lighting Retrofit F1 F96T12, 2 Lamp Fixtures: Replace Lamps and Ballasts

Bldg No	Room No	No of Fixtures	ECO Savings (kW)	ECO Savings (kWH/Yr)	ECO Rebate (\$)	ECO Investment (\$)	ECO Total Savings (\$/Year)	ECO LCC Savings (\$)
70525	Kitchen	2	0.080	374	\$20	\$182	\$20	\$244
90312	Warehouse	18	0.720	1,498	\$180	\$1,640	\$140	\$1,688
Totals for Re	trofit Type F1:	20	0.800	1,872	\$200 SIR	\$1,822 1.06	\$161 Payback	\$1,932 11,35

# Table 9. Lighting Retrofit F2 F96T12, 4 Lamp Fixtures: Replace Lamps and Ballasts

Bldg No	Room No	No of Fixtures	ECO Savings (kW)	ECO Savings (kWH/Yr)	ECO Rebate (\$)	ECO Investment (\$)	ECO Total Savings (\$/Year)	ECO LCC Savings (\$)
61701	Sports Admin.	1	0.080	166	\$20	\$182	\$16	\$187
Totals for Re	strofit Type F2:	1	0.080	166	\$20	\$182	\$16	\$187
					SIR	1.03	Payback	11.73

# Table 10. Lighting Retrofit G1 Incandescent 60W Downlight: Replace Lamp with Compact Fluorescent Lamp

			ECO	ECO		ECO	ECO Total	ECO LCC
		No of	Savings	Savings	ECO	Investment	Savings	Savings
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	(\$)
22422	Basement	1	0.045	70	\$5	\$18	\$13	\$153
22422	Basement	1	0.045	70	\$5	\$18	\$13	\$153
Totals for Ret	trofit Type G1:	2	0.089	139	\$10	\$37	\$26	\$306
					SIR	8.36	Payback	1.44

Table 11. Lighting Retrofit G2 Incandescent 75W Downlight:
Replace Lamp with Compact Fluorescent Lamp

Bidg No	Room No	No of Fixtures	ECO Savings (kW)	ECO Savings (kWH/Yr)	ECO Rebate (\$)	ECO Investment (\$)	ECO Total Savings (\$/Year)	ECO LCC Savings (\$)
20200	Corridor	1	0.055	60	\$5	\$9	\$24	\$291
20200	Extr.Entry	1	0.055	60	\$5	\$9	\$24	\$291
20200	Extr.Storage	1	0.055	29	<b>\$</b> 5	\$9	\$10	\$122
20200	Furnace	1	0.055	14	<b>\$</b> 5	\$9	\$9	\$103
43002	1 A	10	0.550	858	<b>\$</b> 5	\$9	\$214	\$2,569
43002	1 B	6	1.380	2,153	<b>\$</b> 5	\$9	\$342	\$4,107
43002	Basement	4	0.220	1,373	\$5	\$9	\$177	\$2,116
Totals for R	letrofit Type G2:	24	2.370	4,547	\$35 SIR	\$62 153.60	\$800 Payback	\$9,598 0.08

Table 12. Lighting Retrofit G3 Incand. 40W Ceiling or Wall-Mount Fixture: Replacement Compact Fluorescent

Bldg No	Room No	No of Fixtures	ECO Savings (kW)	ECO Savings (kWH/Yr)	ECO Rebate (\$)	ECO Investment (\$)	ECO Total Savings (\$/Year)	ECO LCO Savings (\$)
43002	1st Floor	5	0.158	246	\$15	\$78	\$47	\$561
43002	1st Floor	8	0.252	393	\$24	\$124	\$75	\$898
43002	1st Floor	16	0.504	786	\$48	\$249	\$150	\$1,795
43002	1st Floor	37	1.166	1,818	\$111	\$575	\$346	\$4,151
57428	106	1	0.032	66	\$3	\$16	\$11	\$133
70525	Toilet	2	0.126	590	\$12	\$62	\$68	\$818
70525	Toilet	2	0.126	590	\$12	\$62	\$68	\$818
otals for Re	etrofit Type G3:	71	2.363	4,488	\$225 SIR	\$1,166 7.87	\$765 Payback	\$9,175 1.52

Table 13. Lighting Retrofit G4 Incand. 60W Ceiling or Wall-Mount Fixture: Replacement Compact Fluorescent

		No of	ECO Savings	ECO Savings	ECO	ECO Investment	ECO Total Savings	ECO LCC Savings
Bidg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	(\$)
20200	Bathroom	1	0.089	279	\$10	\$38	\$34	\$411
20200	Entry	1	0.045	49	<b>\$</b> 5	\$19	\$15	\$175
43002	1 A	4	0.179	279	\$20	\$76	\$55	\$661
43002	1 C	4	0.179	46	\$20	\$76	\$31	\$376
43002	Basement	1	0.045	112	<b>\$</b> 5	\$19	\$16	\$189
61701	Locker Rooms	32	1.430	2,975	\$160	\$610	\$427	\$5,121
80305	207	1	0.045	23	\$5	\$19	\$8	\$92
80305	307	1	0.045	23	<b>\$</b> 5	\$19	\$8	\$92
Totals for I	Retrofit Type G4:	45	2.056	3,786	\$230	\$876	<b>\$593</b>	\$7,117
					SIR	8 12	Payback	1 48

Table 14. Lighting Retrofit G5 Incandescent 100W Ceiling Fixture:
Replace Lamp with Compact Fluorescent

Bldg No	, Room No	No of Fixtures	ECO Savings (kW)	ECO Savings (kWH/Yr)	ECO Rebate (\$)	ECO Investment (\$)	ECO Total Savings (\$/Year)	ECO LCC Savings (\$)
20200	Dining	1	0.231	252	\$15	\$89	\$55	\$664
20200	Living Room	1	0.077	168	<b>\$</b> 5	\$30	\$23	\$270
43002	1st Floor	20	1.540	3,844	\$100	\$596	\$272	\$3,281
43002	Basement	3	0.231	60	<b>\$15</b>	\$89	\$39	\$474
61701	Sports Admin.	1	0.077	160	<b>\$</b> 5	\$30	\$27	\$320
70525	Dishwash	2	0.154	480	\$10	\$60	\$31	\$378
Totals for Retrofit Type G5:		28	2.310	4,965	\$150 SIR	\$894 6.02	\$448 Payback	\$5,38 <b>6</b> 2.00

Table 15. Lighting Retrofit H1 Incandescent 60W and 75W Table Lamps:
Replacement Compact Fluorescents

Replacement Compact Fluorescents									
			ECO	ECO		ECO	ECO Total	ECO LCC	
		No of	Savings	Savings	ECO	Investment	Savings	Savings	
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	(\$)	
20200	Bedroom(master)	1	0.043	94	<b>\$</b> 5	\$20	\$14	\$168	
80305	117	2	0.086	188	\$10	\$39	\$28	\$337	
80305	119	2	0.086	188	<b>\$10</b>	\$39	\$28	\$337	
80305	120	2	0.086	188	\$10	\$39	\$28	\$337	
80305	122	2	0.086	188	<b>\$10</b>	\$39	\$28	\$337	
80305	123	2	0.086	188	\$10	\$39	\$28	\$337	
80305	125	2	0.086	188	\$10	\$39	\$28	\$337	
80305	126	2	0.086	188	\$10	\$39	\$28	\$337	
80305	128	2	0.086	188	\$10	\$39	\$28	\$337	
80305	130	2	0.086	188	\$10	\$39	\$28	\$337	
80305	131	2	0.086	188	\$10	\$39	\$28	\$337	
80305	132	2	0.086	188	\$10	\$39	\$28	\$337	
80305	134	2	0.086	188	\$10	\$39	\$28	\$337	
80305	135	2	0.086	188	\$10	\$39	\$28	\$337	
80305	137	2	0.086	188	\$10	\$39	\$28	\$337	
80305	138 140	2	0.086	188	\$10 410	\$39 \$39	\$28	\$337	
80305	141	2 2	0.086	188	\$10 \$10		\$28	\$337	
80305 80305	143	2	0.086 0.086	188 188	\$10 \$10	\$39 \$39	\$28 \$28	\$337 \$337	
80305	144	2	0.086	188	\$10	\$39 \$39	\$28	\$337 \$337	
80305	146	2	0.086	188	\$10	\$39 \$39	\$28	\$337 \$337	
80305	147	2	0.086	188	\$10	\$39	\$28	\$337 \$337	
80305	148	2	0.086	188	\$10	\$39	\$28	\$337	
80305	150	2	0.086	188	\$10	\$39	\$28	\$337	
80305	151	2	0.086	188	\$10	\$39	\$28	\$337	
80305	153	2	0.086	188	\$10	\$39	\$28	\$337	
80305	155	2	0.086	188	\$10	\$39	\$28	\$337	
80305	156	2	0.086	188	\$10	\$39	\$28	\$337	
80305	158	2	0.086	188	\$10	\$39	\$28	\$337	
80305	159	2	0.086	188	\$10	\$39	\$28	\$337	
80305	160	2	0.086	188	\$10	\$39	\$28	\$337	
80305	162	2	0.086	188	\$10	\$39	\$28	\$337	
80305	164	2	0.086	188	\$10	\$39	\$28	\$337	
80305	165	2	0.086	188	\$10	\$39	\$28	\$337	
80305	167	2	0.086	188	\$10	\$39	\$28	\$337	
80305	168	2	0.086	188	\$10	\$39	\$28	\$337	
80305	170	2	0.086	188	\$10	\$39	\$28	\$337	
80305	171	2	0.086	188	\$10	\$39	\$28	\$337	
80305	173	2	0.086	188	\$10	\$39	\$28	\$337	
80305	174	2	0.086	188	\$10	\$39	\$28	\$337	
80305	176	2	0.086	188	\$10	\$39	\$28	\$337	
80305	208	2	0.086	188	\$10	\$39	\$28	\$337	
80305	210	2	0.086	188	\$10	\$39	\$28	\$337	
80305	214	2	0.086	188	\$10	\$39	\$28	\$337	
80305	216	2	0.086	188	\$10	\$39	\$28	\$337	
80305	219	2	0.086	188	\$10	\$39	\$28	\$337	
80305	219.1	2	0.086	188	\$10	\$39	\$28	\$337	
80305	220	2	0.086	188	\$10	\$39	\$28	\$337	
80305	222	2	0.086	188	\$10	\$39	\$28	\$337	
80305	223	2	0.086	188	\$10	\$39	\$28	\$337	
80305	225	2	0.086	188	\$10	\$39	\$28	\$337	
80305	226	2	0.086	188	\$10 410	\$39	\$28	\$337	
80305 80305	228	2	0.086	188	\$10 \$10	<b>\$39</b>	\$28	\$337 \$337	
80305 80305	229	2	0.086	188	\$10 410	\$39 \$30	\$28	\$337 \$337	
80305	231 232	2 2	0.086	188	\$10 \$10	\$39 \$30	\$28 *28	\$337 \$337	
80305 80305	232 234	2	0.086 0.086	188 188	\$10 \$10	\$39 \$30	\$28 *20	\$337 \$337	
80305	23 <del>4</del> 235		0.086			\$39 430	\$28 \$28	\$337 \$337	
80305		2		188	\$10 \$10	\$39 \$30	\$28 428		
80305	237 238	2 2	0.086 0.086	188 188	\$10 \$10	\$39 \$39	\$28 \$28	\$337 \$337	
80305	430	4	0.080	100	910	<b>438</b>	420	<b>433</b> /	

Table 15. Lighting Retrofit H1 Incandescent 60W and 75W Table Lamps:
Replacement Compact Fluorescents

Replacement Compact Fluorescents									
			ECO	ECO		ECO	ECO Total	ECO LCC	
		No of	Savings	Savings	ECO	Investment	Savings	Savings	
Bldg No	Room No	Fixtures	(kW)	(kWH/Yr)	Rebate (\$)	(\$)	(\$/Year)	(\$)	
80305	240	2	0.086	188	\$10	\$39	\$28	\$337	
80305	241	2	0.086	188	\$10	\$39	\$28	\$337	
80305	243	2	0.086	188	\$10	\$39	\$28	\$337	
80305	244	2	0.086	188	\$10	\$39	\$28	\$337	
80305	246	2	0.086	188	\$10	\$39	\$28	\$337	
80305 80305	247 249	2	0.086	188	\$10	\$39	\$28	\$337	
80305	249 250	2 2	0.086 0.086	188 188	\$10 \$10	\$39 \$39	\$28 \$28	\$337 \$337	
80305	25 <b>2</b>	2	0.086	188	\$10	\$3 <del>9</del>	\$28	\$337 \$337	
80305	253	2	0.086	188	\$10	\$39	\$28	\$337 \$337	
80305	255	2	0.086	188	\$10	<b>\$39</b>	\$28	\$337 \$337	
80305	256	2	0.086	188	\$10	<b>\$39</b>	\$28	\$337	
80305	258	2	0.086	188	\$10	\$39	\$28	\$337	
80305	259	2	0.086	188	\$10	\$39	\$28	\$337	
80305	261	2	0.086	188	\$10	\$39	\$28	\$337	
80305	264	2	0.086	188	\$10	\$39	\$28	\$337	
80305	264.1	2	0.086	188	\$10	\$39	\$28	\$337	
80305	265	2	0.086	188	\$10	\$39	\$28	\$337	
80305	287	2	0.086	188	\$10	\$39	\$28	\$337	
80305	268	2	0.086	188	\$10	\$39	\$28	\$337	
80305	270	2	0.086	188	\$10	\$39	\$28	\$337	
80305	271	2	0.086	188	\$10	\$39	\$28	\$337	
80305	273	2	0.086	188	\$10	\$39	\$28	\$337	
80305	308	2	0.086	188	\$10	\$39	\$28	\$337	
80305	310	2	0.086	188	\$10	\$39	\$28	\$337	
80305	314	2	0.086	188	\$10	\$39	\$28	\$337	
80305	316	2	0.086	188	\$10	\$39	\$28	\$337	
80305	319	2	0.086	188	\$10	\$39	\$28	\$337	
80305 80305	319.1 320	2 2	0.086 0.086	188	\$10 \$10	\$39 \$39	\$28 \$28	\$337 \$337	
80305	322	2	0.086	188 188	\$10 \$10	\$3 <del>9</del>	\$28	\$337 \$337	
80305	323	2	0.086	188	\$10	\$39	\$28	\$337 \$337	
80305	325	2	0.086	188	\$10	\$39	\$28	\$337	
80305	326	2	0.086	188	\$10	\$39	\$28	\$337	
80305	328	2	0.086	188	\$10	\$39	\$28	\$337	
80305	329	2	0.086	188	\$10	\$39	\$28	\$337	
80305	331	2	0.086	188	\$10	\$39	\$28	\$337	
80305	332	2	0.086	188	\$10	\$39	\$28	\$337	
80305	334	2	0.086	188	\$10	\$39	\$28	\$337	
80305	335	2	0.086	188	\$10	\$39	\$28	\$337	
80305	337	2	0.086	188	\$10	\$39	\$28	\$337	
80305	338	2	0.086	188	\$10	\$39	\$28	\$337	
80305	340	2	0.086	188	\$10	\$39	\$28	\$337	
80305	341	2	0.086	188	\$10	\$39	\$28	\$337	
80305	343	2	0.086	188	\$10	\$39	\$28	\$337	
80305	344	2	0.086	188	\$10	\$39	\$28	\$337	
80305	346	2	0.086	188	\$10	\$39	\$28	\$337	
80305	347	2	0.086	188	\$10	\$39	\$28	\$337	
80305	349	2	0.086	188	\$10	\$39	\$28	\$337	
80305 80305	350 352	2	0.086	188	\$10 410	\$39	\$28	\$337	
80305	352 353	2	0.086	188	\$10 \$10	\$39 \$30	\$28 428	\$337 \$337	
80305	353 355	2 2	0.086 0.086	188 188	\$10 \$10	\$39 \$39	\$28 \$28	\$337 \$337	
80305	356 356	2	0.086	188	\$10 \$10	\$39 \$39	\$28 \$28	\$337 \$337	
80305	358	2	0.086	188	\$10 \$10	\$39	\$28	\$337 \$337	
80305	359	2	880.0	188	\$10	\$39	\$28	\$337	
80305	361	2	0.086	188	\$10	\$39	\$28	\$337	
80305	364	2	0.086	188	\$10	\$39	\$28	\$337	
80305	364.1	2	0.086	188	\$10	\$39	\$28	\$337	
80305	365	2	0.086	188	\$10	\$39	\$28	\$337	

Table 15. Lighting Retrofit H1 Incandescent 60W and 75W Table Lamps:
Replacement Compact Fluorescents

Bldg No	Room No	No of Fixtures	ECO Savings (kW)	ECO Savings (kWH/Yr)	ECO Rebate (\$)	ECO Investment (\$)	ECO Total Savings (\$/Year)	ECO LCC Savings (\$)
80305	367	2	0.086	188	\$10	\$39 '	\$28	\$337
80305	368	2	0.086	188	\$10	\$39	\$28	\$337
80305	370	2	0.086	188	\$10	\$39	\$28	\$337
80305	371	2	0.086	188	\$10	\$39	\$28	\$337
80305	373	2	0.086	188	\$10	\$39	\$28	\$337
Totals for Re	trofit Type H1:	249	10.707	23,384	\$1,245 SIR	\$4,876 8.60	\$3,493 Payback	\$41,911 1.40

Table 16. Lighting Retrofit J1 250W MV Pendant-Mount Fixture: Replace Lamp & Ballast with HPS

Bldg No	Room No	No of Fixtures	ECO Savings (kW)	ECO Savings (kWH/Yr)	ECO Rebate (\$)	ECO Investment (\$)	ECO Total Savings (\$/Year)	ECO LCC Savings (\$)
61701	Workout	9	0.873	1,816	\$87	\$1,791	\$214	\$2,571
61701	Racquetball Court	12	1.164	1,816	\$116	\$2,388	\$256	\$3,076
61701	Racquetball Court	12	1.164	1,816	\$116	\$2,388	\$256	\$3,076
Totals for f	Retrofit Type J1:	33	3.201	5,448	\$320 SIR	\$6,568 1.33	\$726 Payback	\$8,724 9.05

Table 17. Lighting Retrofit J2 400W MV Pendant-Mount Fixture:
Replace Lamp & Ballast with HPS

Bidg No	Room No	No of Fixtures	ECO Savings (kW)	ECO Savings (kWH/Yr)	ECO Rebate (\$)	ECO Investment (\$)	ECO Total Savings (\$/Year)	ECO LCC Savings (\$)
61701	Gym	48	10.032	20,867	\$1,003	\$7,455	\$2,432	\$29,226
61701	Racquetball Court	6	1.254	2,608	\$125	\$932	\$304	\$3,653
Totals for I	Retrofit Type J2:	54	11.286	23,475	\$1,129 SIR	\$8,387 3.92	\$2,736 Payback	\$32,880 3.06

Table 18. Lighting Controls Retrofit K1: Ceiling Mounted PIR Occupancy Sensors

3ldg No	Room No	Number Sensors	Energy Saved (kWH/Year)	Annual Cost Saved	Cost	ECO Construction	ECO Rebate (\$)	ECO Investme
		Required		(\$/Year)	Saved (\$)	Cost (\$)		(\$)
15544	103	2	1,968	\$110.31	\$1,325	\$608	\$16	\$665
15544	104	2	2,029	\$118.97	\$1,428	\$608	\$16	\$665
15544	105	6	3,136	\$183.86	\$2,207	\$1,824	\$48	\$1,995
15544	106	2	2,583	\$144.78	\$1,739	\$608	\$16	\$665
15544	107	4	4,673	\$261.98	\$3,146	\$1,216	\$32	\$1,330
15544	111	3	3,812	\$213.72	\$2,567	\$912	\$24	\$998
15544	113	3	3,443	\$193.04	\$2,318	\$912	\$24	\$998
15544	114	2	1,937	\$113.56	\$1,363	\$608	\$16	\$665
22422	101	1	215	\$12.72	\$153	\$304	\$4	\$337
22422	108	1	429	\$25.45	\$306	\$304	\$8	\$333
22422	111	2	805	\$47.72	\$573	\$608	\$16	\$665
22422	116	1	537	\$31.81	\$382	\$304	\$8	\$333
22422	201	1	215	\$12.72	\$153	\$304	\$4	\$337
22422	202	1	215	\$12.72	\$153	\$304	\$4	\$337
22422	203	1	429	\$25.45	\$306	\$304	\$8	\$333
22422	205	3	1,503	\$89.07	\$1,069	\$912	\$24	\$998
22422	212	1	177	\$10.99	\$132	\$304	\$4	\$337
43002	1st Floor	1	107	\$6.36	\$76	\$304	\$4	\$337
43002	1st Floor	2	287	\$100.48	\$1,201	\$608	\$16	<b>\$665</b>
53301	103	10	8,461	\$497.49	\$5,973	\$3,041	\$80	\$3,326
53301	104	1	312	\$18.38	\$221	\$304	\$4	\$337
53301	105	1	312	\$18.38	\$221	\$304	\$4	\$337
53301	107	1	312	\$18.38	\$221	\$304	\$4	\$337
53301	117	1	449	\$26.42	\$317	\$304	\$8	\$333
53301	119	3	2,172	\$127.67	\$1,533	<b>\$912</b>	\$24	\$998
53301	120	2	973	\$57.23	\$687	\$608	\$16	<b>\$665</b>
53301	121	1	208	\$12.25	\$147	\$304	\$4	\$337
53301	124	3	2,321	\$136.48	\$1,639	\$912	\$24	\$998
53301	126	1	208	\$12.25	\$147	\$304	\$4	<b>\$337</b>
53301	128	1	599	\$35.22	\$423	\$304	\$8	\$333
53301	129	1	208	\$12.25	\$147	\$304	\$4	\$337
53301	202	11	18,271	\$1,051.62	\$12,627	\$3,345	\$88	\$3,658
53301	217	6	7,176	\$422.77	\$5,076	\$1,824	\$48	\$1,995
53301	220	1	832	\$49.02	<b>\$588</b>	\$304	\$8	\$333
56301	107	1	655	\$38.6	<b>\$</b> 463	\$304	\$8	\$333
56301	109	1	749	\$44.12	\$530	\$304	\$8	\$333
56301	113	2	1,685	\$99.26	\$1,192	\$608	\$16	\$665
56301	115	2	1,348	\$79.25	\$951	\$608	\$16	\$665
56301	118	2	1,078	\$63.4	\$761	\$608	\$16	<b>\$665</b>
56301	121	2	1,617	\$95.09	\$1,142	\$608	\$16	<b>\$665</b>
56301	126	2	1,685	\$99.26	\$1,192	\$608	\$16	<b>\$665</b>
56301	134	2	1,966	\$115.8	\$1,390	\$608	\$16	<b>\$665</b>
56301	137	2	2,246	\$132.35	\$1,589	\$608	\$16	\$665
56301	138	2	1,872	\$110.29	\$1,324	\$608	\$16	<b>\$665</b>
56301	140	1	936	\$55.14	\$662	\$304	\$8	\$333
56301	141	1	468	\$27.57	\$331	\$304	\$4	\$337
56301	154	1	1,030	\$60.66	\$728	\$304	\$8	\$333
56301	130, Lab	1	809	\$47.55	\$571	\$304	\$8	\$333
56301	143	1	1,123	\$66.17	\$794	\$304	\$8	<b>\$333</b>
56301	144	1	842	\$49.63	<b>\$596</b>	\$304	\$8	\$333
56301	145	1	1,123	\$66.17	\$794	\$304	\$8	\$333
56301	153A	1	539	\$31.7	\$381	\$304	\$8	\$333
57428	105	1	1,248	\$73.53	\$883	\$304	\$8	\$333
57428	107	2	1,872	\$110.29	\$1,324	\$608	\$16	\$665
57428	114	1	416	\$24.51	\$294	\$304	\$4	\$337
57428	115	1	416	\$24.51	\$294	\$304	\$4	\$337
57428	123	2	1,664	\$98.03	\$1,177	\$608	\$16	\$665
57428	130	3	5,545	\$310.86	\$3,733	\$912	\$24	\$998
57428	131	1	2,147	\$120.33	\$1,445	\$304	\$8	\$333
57428	202	1	416	\$24.51	\$294	\$304	\$4	\$337
57428	209	1	416	\$24.51	\$294	\$304	\$4	\$337
57428 57428	217	2	1,872	\$110.29	\$1,324	\$608	\$16	\$665
J, 72U	217		•	¥ 1 10.23				
61701	Area	1	312	\$17.6	\$211	\$304	\$8	\$333

Table 18. Lighting Controls Retrofit K1: Ceiling Mounted PIR Occupancy Sensors

Bidg No	Room No	Number Sensors	Energy Saved (kWH/Year)	Annual Cost Saved	Cost	ECO Construction	ECO Rebate (\$)	ECO Investme
61701	04:	Required	F07	(\$/Year)	Saved (\$)	Cost (\$)		(\$)
61701	Office	1	537	\$30.64	\$368	\$304	\$8	\$333
62704	W10	2	1,409	\$82.59	\$992	\$608	\$16	\$665
62704	W11	2	1,409	\$82.59	\$992	\$608	\$16	\$665
62704	W2	2	1,409	\$82.59	\$992	\$608	\$16	<b>\$665</b>
62704	W3	2	1,811	\$106.19	\$1,275	\$608	\$16	\$665
62704	W4	2	1,409	\$82.59	\$992	\$608	\$16	\$665
62704	W5	2	1,409	\$82.59	\$992	\$608	\$16	\$665
62704	W6	2	1,409	\$82.59	\$992	\$608	\$16	\$665
62704	W7	2	1,409	\$82.59	\$992	\$608	\$16	\$665
62704	W8	2	1,409	\$82.59	\$992	\$608	\$16	\$665
62704	W9	2	1,409	\$82.59	\$992	\$608	\$16	\$665
62704		2	1,811	\$106.19	\$1,275	<b>\$608</b>	\$16	<b>\$665</b>
70525	Offices	1	671	\$44.16	<b>\$530</b>	\$304	\$8	\$333
70525	Whse	1	156	\$10.84	<b>\$130</b>	\$304	\$4	\$337
80305	OR	1	187	\$11.52	\$138	\$304	\$4	\$337
80305	OR	1	187	\$11.52	<b>\$138</b>	\$304	\$4	\$337
80305	OR	1	499	\$30.73	\$369	\$304	\$8	\$333
B0305	OR	1	562	\$34.57	\$415	\$304	\$8	\$333
80505	102	2	374	\$23.52	\$282	\$608	\$8	\$673
80505	103	3	1,121	\$70.57	\$847	\$912	\$24	\$998
80505	104	2	374	\$23.52	\$282	\$608	\$8	\$673
80505	106	2	374	\$23.52	\$282	\$608	\$8	\$673
80505	108	2	374	\$23.52	\$282	\$608	\$8	<b>\$673</b>
80505	110	2	374	\$23.52	\$282	\$608	\$8	<b>\$673</b>
80505	131	2	872	\$48.53	<b>\$583</b>	\$608	\$16	\$665
30505	142	2	332	\$18.49	\$222	\$608	\$8	\$673
80505	145	2	390	\$25.65	\$308	\$608	\$16	\$665
30505	146	6	1,994	\$110.93	\$1,332	\$1,824	\$48	\$1,995
80505	151	1	498	\$27.73	\$333	\$304	\$8	\$333
80505	176	2	665	\$36.98	\$444	\$608	\$16	<b>\$665</b>
30505	179	1	249	\$13.87	\$167	\$304	\$8	\$333
80505	181	1	374	\$18.76	\$225	\$304	\$8	\$333
80505	210	5	1,246	\$87.5	\$1,050	\$1,520	\$40	\$1,663
80505	212	1	498	<b>\$35</b> .	\$420	\$304	\$8	\$333
80505	213	1	74	\$10.84	\$130	\$304	\$8	\$333
80505	231	1	208	\$14.58	\$175	\$304	\$4	\$337
80505	234	2	498	<b>\$35</b> .	\$420	\$608	\$16	<b>\$665</b>
80505	236	2	498	<b>\$35</b> .	\$420	\$608	\$16	\$665
80505	237	1	231	\$12.98	\$156	\$304	\$8	\$333
80505	245	2	748	<b>\$52.5</b>	\$630	\$608	\$16	\$665
80505	248	1	498	\$33.18	\$398	\$304	\$8	\$333
80505	249	1	74	\$9.63	\$115	\$304	\$8	\$333
80505	278	1	498	\$33.18	\$398	\$304	\$8	\$333
80505	280	6	1,994	\$118.19	\$1,419	\$1,824	\$48	\$1,995
80505	118 C	2	665	\$33.34	\$401	\$608	\$16	<b>\$665</b>
80505	162B	1	332	\$17.28	\$208	\$304	\$8	\$333
80505	203-5	3	1,121	\$56.27	\$676	\$912	\$24	<b>\$998</b>
30505	242 + 276	2	665	\$34.55	\$415	\$608	\$16	<b>\$665</b>
80505	244 + 246	2	665	\$39.4	\$473	\$608	\$16	<b>\$665</b>
80505	277 + 281	2	748	\$37.51	\$451	\$608	\$16	<b>\$665</b>
90312	Office	1	572	\$33.19	\$399	\$304	\$8	<b>\$333</b>
90312	Office	1	572	\$33.19	\$399	\$304	\$8	\$333
90312	Office	1	572	\$33.19	\$399	\$304	\$8	\$333
90312	Office	1	716	\$41.49	\$498	\$304	<b>\$8</b>	\$333
90312	Warehouse	2	1,479	\$85.55	\$1,027	\$608	\$16	\$665
90507	Office	1	322	\$19.09	\$229	\$304	<b>\$8</b>	\$333
91114	1st E Office	1	644	\$38.17	\$458	\$304	<b>\$8</b>	\$333
91114	1st E Tools	2	932	\$45.05	<b>\$542</b>	\$608	<b>\$16</b>	\$885
91114	1st W QC Office	1	644	\$38.17	\$458	\$304	\$8	\$333
91114	2nd E Chief	1	644	\$38.17	\$458	\$304	<b>\$8</b>	\$333
91114	2nd W Elec. Repair	1	716	\$42.42	<b>\$509</b>	\$304	<b>\$8</b>	\$333
91114	2nd W Storage	2	850	\$55.94	\$871	\$608	\$16	\$665
	CO K1	239		+++++	7071	7000	710	4000

Payback 8.33

SIR 1.44

Table 19. Lighting Controls Retrofit K3: Wall Switch PIR Occupancy Sensor

Bldg No	Room No	Number Sensors Required	Energy Saved (kWH/Year)	Annual Cost Saved (\$/Year)	Total LCC Cost Saved (\$)	ECO Construction Cost (\$)	ECO Rebate (\$)	ECO Investment (\$)
15544	103A	1	492	\$27.58	\$331	\$102	\$4	\$111
20200	Extr.Storage	1	3	\$.78	\$9	\$102	\$4	\$111
20200	Furnace	1	1	\$.39	<b>\$</b> 5	\$102	\$4	\$111
22422	102	1	215	\$12.72	\$153	\$102	\$4	\$111
22422	103	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	104	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	107	1	215	\$12.72	<b>\$153</b>	\$102	\$4	\$111
22422	109	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	110	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	112	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	113	1	107	\$6.36	<b>\$76</b>	\$102	\$4	\$111
22422	114	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	115	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	204	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	206	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	207	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	208	1	215	\$12.72	<b>\$153</b>	\$102	\$4	\$111
22422	209	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	210	1	107	\$6.36	\$76	\$102	\$4	\$111
22422	211	1	187	\$11.52	\$138	\$102	\$4	\$111
22422	108A	1	215	\$12.72	\$153	\$102	\$4	\$111
22422	Basement	1	11	\$.64	\$8	\$102	\$4	\$111
22422	PS1	1	268	\$15.91	\$191	\$102	\$4	\$111
43002	1 C	1	4	\$6.86	\$82	\$102	\$4	\$111
43002	1 E	1	11	\$.93	\$11	\$102	\$4	\$111
43002	1 F/G	1	161	\$9.54	\$115	\$102	\$4	\$111
43002	1 H	1	17	\$1.4	\$17	\$102	\$4	\$111
43002	1st Floor	1	54	\$3.18	\$38	\$102	\$4	\$111
43002	1st Floor	1	54	\$3.18	\$38	\$102	\$4	\$111
43002	1st Floor	1	107	\$6.36	\$76 470	\$102 4100	\$4	\$111
43002	1st Floor	1	107	\$6.36	<b>\$76</b>	\$102	\$4	\$111
43002 43002	1st Floor 2 Balcony A	1	6 45	\$.47 40.70	\$6 445	\$102	\$4	\$111 4407
43002	2 Balcony A 2 Balcony B	1	45 45	\$3.73 \$3.73	\$45 \$45	\$102 \$102	\$8 \$8	\$107
43002	2 Balcotty B	1	322	\$3.73 \$19.09	\$229	\$102 \$102	\$6 \$8	\$107 \$107
43002	2 D	1	107	\$6.36	\$229 \$76	\$102 \$102	\$6 \$4	\$107 \$111
43002	Basement	1	22	\$1.77	\$21	\$102	\$4	\$111
43002	Basement	1	11	\$.93	\$11	\$102	\$4	\$111
43002	Basement	1	4	\$3.31	\$40	\$102	\$4	\$111
53301	109	1	187	\$12.96	\$155	\$102	\$4	\$111
53301	114	1	22	\$1.5	\$18	\$102	\$4	\$111
53301	124	i	312	\$18.38	\$221	\$102	\$4	\$111
53301	127	1	150	\$8.81	\$106	\$102	\$4	\$111
53301	203	1	449	\$25.86	\$311	\$102	\$4	\$111
53301	204	1	449	\$25.86	\$311	\$102	\$4	\$111
53301	206	1	449	\$25.86	\$311	\$102	\$4	\$111
53301	214	1	312	\$18.38	\$221	\$102	\$4	\$111
53301	214	1	22	\$1.5	\$18	\$102	\$4	\$111
53301	218	1	416	\$24.51	\$294	\$102	\$4	\$111
53301	221	1	416	\$24.51	\$294	\$102	\$4	\$111
53301	222	1	416	\$24.51	\$294	\$102	\$4	\$111
53301	223	1	416	\$24.51	\$294	\$102	\$4	\$111
53301	224	1	416	\$24.51	\$294	\$102	\$4	\$111
53301	225	1	416	\$24.51	\$294	\$102	\$4	\$111
56301	108	1	562	\$33.09	\$397	\$102	\$8	\$107
56301	109	1	562	\$33.09	\$397	\$102	<b>\$</b> 8	<b>\$107</b>
56301	114	1	270	\$15.85	\$190	\$102	\$4	\$111
56301	116	1	270	\$15.85	\$190	\$102	\$4	\$111
56301	117	1	202	\$11.89	\$143	\$102	\$4	\$111
56301	119	1	135	\$7.92	\$95	\$102	\$4	\$111
56301	120	1	270	\$15.85	\$190	\$102	\$4	\$111
	122	1	135	\$7.92	\$95	\$102	\$4	\$111
56301								
56301 56301	128	1	187	\$11.03	\$132	\$102	\$4	\$111

Table 19. Lighting Controls Retrofit K3: Wall Switch PIR Occupancy Sensor

Bldg No	Room No	Number Sensors Required	Energy Saved (kWH/Year)	Annual Cost Saved (\$/Year)	Total LCC Cost Saved	ECO Construction Cost (\$)	ECO Rebate (\$)	ECO Investmen (\$)
56301	130	nequirea 1	135	\$7.92	(\$) \$95	\$102	\$4	\$111
56301	133		281			\$ 102 \$ 102	\$4 \$4	
		1		\$16.54	\$199 4122			\$111
56301	135	1	187	\$11.03	\$132	\$102	\$4	\$111
56301	136	1	187	\$11.03	\$132	\$102	\$4	\$111
56301	139	1	187	\$11.03	\$132	\$102	\$4	\$111
56301	140	1	94	\$6.75	\$81	\$102	\$4	\$111
56301	152	1	468	\$27.57	\$331	\$102	\$4	\$111
56301	154	1	67	\$4.8	<b>\$58</b>	<b>\$</b> 102	\$4	\$111
56301	113C	1	562	\$33.09	\$397	\$102	\$8	\$107
57428	102	1	89	\$5.89	\$71	\$102	\$4	\$111
57428	106	1	4	\$.43	<b>\$</b> 5	\$102	\$4	\$111
57428	108	1	208	\$14.45	\$173	\$102	\$4	\$111
57428	109	1	312	\$21.68	\$260	\$102	\$8	\$107
57428	118	1	624	\$36.76	\$441	\$102	\$8	\$107
57428	120	1	624	\$36.76	\$441	\$102	\$8	\$107
57428	126	1	312	\$21.68	\$260	\$102	\$8	\$107
57428	127	1	312	\$21.68	\$260	\$102	<b>\$8</b>	\$107
	203	1	416					
57428				\$24.51	\$294	\$102	\$4	\$111
57428	204	1	624	\$36.76	\$441	\$102	\$8	\$107
57428	207	1	520	\$30.64	\$368	\$102	\$4	\$111
57428	208	1	520	\$30.64	\$368	\$102	\$4	\$111
57428	216A	1	416	\$24.51	\$294	\$102	\$4	\$111
57428	216B	1	416	\$24.51	\$294	\$102	\$4	\$111
61701	Office	1	89	\$5.11	\$61	\$102	\$4	\$111
61701	Office	1	134	\$7.66	\$92	\$102	\$4	\$111
61701	Pool Office	1	89	\$5.11	\$61	\$102	\$4	\$111
61701	Sports Admin.	1	164	\$9.41	\$113	\$102	\$4	\$111
61701	Sports Admin.	1	89	\$5.01	\$60	\$102	\$4	\$111
61701	Sports Admin.	1	12	\$3.16	\$38	\$102	\$4	\$111
61701	Supplies	1	45	\$2.55	\$31	\$102	\$4	\$111
70525	Dishwash	1	67	\$4.42	\$53	\$102	\$ <del>4</del>	\$111
70525	Dishwash	1	36	\$4.83		\$102	\$4	\$111
					<b>\$58</b>			
70525	Office	1	134	\$8.83	\$106	\$102	\$4	\$111
70525	Offices	1	335	\$22.08	\$265	\$102	\$4	\$111
70525	Supply	1	67	\$4.42	\$53	\$102	\$4	\$111
70525	Whse	1	67	\$4.42	<b>\$53</b>	\$102	\$4	\$111
70525	Whse	1	268	\$17.67	\$212	\$102	\$4	\$111
80305	103	1	447	\$25.53	\$307	\$102	\$4	\$111
80305	104	1	335	\$19.15	\$230	\$102	\$4	\$111
80305	109	1	224	\$12.77	\$153	\$102	\$4	\$111
80305	110	1	54	\$3.18	\$38	\$102	\$4	\$111
80305	112	1	7	\$.37	\$4	\$102	\$4	\$111
80305	113	1	22	\$1.28	\$15	\$102	\$4	\$111
80305	114	1	11	\$.64	<b>\$8</b>	\$102	\$4	\$111
80305	115	i	45	\$2.55	\$31	\$102	\$4	\$111
80305	201	1	107	\$6.36	\$31 \$76			
						\$102	\$4	\$111
80305	202	1	11	\$.64	\$8	\$102	\$4	\$111
80305	203	1	447	\$25.53	\$307	\$102	\$4	\$111
80305	204	1	54	\$3.18	\$38	\$102	\$4	\$111
80305	205	1	563	\$32.17	\$386	\$102	\$4	\$111
80305	207	1	2	\$.2	\$2	\$102	\$4	\$111
80305	208	1	215	\$12.72	<b>\$153</b>	\$102	\$4	\$111
80305	208	1	671	\$38.3	\$460	\$102	\$8	\$107
80305	301	1	107	\$6.36	\$76	\$102	\$4	\$111
80305	302	1	11	\$.84	<b>\$8</b>	\$102	\$4	\$111
80305	303	1	143	\$8.48	\$102	\$102	\$4	\$111
80305	303	1	447	\$25.53	\$307	\$102	\$4	\$111
80305	304	1	54	\$3.18	\$38	\$102	\$4	\$111
80305	305	1	563					
				\$32.17	\$386	\$102 \$100	\$4	\$111
80305	305	1	563	\$32.17	\$386	\$102	\$4	\$111
80305	307	1	2	\$.69	<b>\$8</b>	\$102	\$4	\$111
80305	308	1	215	<b>\$12.72</b>	<b>\$153</b>	<b>\$102</b>	\$4	\$111
00205	OR	1	187	\$11.52	\$138	\$102	\$4	\$111
80305 80305	OR	1	187	******	7.00	*	• •	*

Table 19. Lighting Controls Retrofit K3: Wall Switch PIR Occupancy Sensor

Bldg No	Room No	Number Sensors Required	Energy Saved (kWH/Year)	Annual Cost Saved (\$/Year)	Total LCC Cost Saved (\$)	ECO Construction Cost (\$)	ECO Rebate (\$)	ECO Investment (\$)
80305	OR	1	166	\$10.24	\$123	\$102	\$4	\$111
80305	OR	1	499	\$30.73	\$369	\$102	\$8	\$107
80305	OR	1	13	\$.77	\$9	\$102	\$4	\$111
80505	139	1	115	\$5.73	\$69	\$102	\$4	\$111
80505	143	1	115	\$6.49	\$78	\$102	\$4	\$111
80505	148	1	332	\$22.12	\$265	\$102	\$8	\$107
80505	152	1	332	\$19.7	\$236	\$102	\$8	\$107
80505	154	1	19	\$1.38	\$17	\$102	\$4	\$111
80505	156	1	19	\$1.38	\$17	\$102	\$4	\$111
80505	158	1	19	\$1.38	\$17	\$102	\$4	\$111
80505	177	1	74	\$8.66	\$104	\$102	\$4	\$111
80505	233	1	173	\$8.83	\$106	\$102	\$8	\$107
80505	250	1	38	\$2.16	\$26	\$102	\$4	\$111
80505	1 MECH	1	55	\$3.13	\$38	\$102	\$8	\$107
80505	118B	1	55	\$4.04	\$48	\$102	\$4	\$111
80505	136+118D	1	87	\$4.49	\$54	\$102	\$4	\$111
90312	Office	1	429	\$24.89	\$299	\$102	\$8	\$107
90507	Office	1	72	\$4.15	\$50	\$102	\$4	\$111
90507	Office	1	358	\$20.75	\$249	\$102	\$4	\$111
90507	Office	1	143	\$8.48	\$102	\$102	\$4	\$111
90508	508	1	447	\$25.53	\$307	\$102	\$8	\$107
91114	1st W QC Library	1	134	\$8.83	\$106	\$102	\$4	\$111
91114	2nd E Acet	1	429	\$25.45	\$306	\$102	\$8	\$107
91114	2nd E Admin	1	429	\$25.45	\$306	\$102	\$8	\$107
91114	2nd E GM	1	429	\$25.45	\$306	\$102	\$8	\$107
91114	2nd E Key Punch	1	429	\$25.45	\$306	\$102	\$8	\$107
91114	2nd E Office	1	215	\$12.72	<b>\$153</b>	\$102	\$4	\$111
91114	2nd E Office	1	429	\$25.45	\$306	\$102	\$8	\$107
91114	2nd E OP Mgr	1	429	\$25.45	\$306	\$102	\$8	\$107
91114	2nd E PLT	1	429	\$25.45	\$306	\$102	\$8	\$107
91114	2nd EQC	1	429	\$25.45	\$306	\$102	\$8	\$107
91114	2nd E Supply Admin	1	429	\$25.45	\$306	\$102	\$8	\$107
91114	2nd E Supply Spec	1	134	\$8.05	\$97	\$102	\$4	\$111
91114	2nd W Elec. Repair	1	447	\$29.44	\$353	\$102	\$8	\$107
Totals		162	35,138	\$2,115	\$25,393	\$16,605	\$768	\$17,829
					0.0			

SIR 1.42

Payback 8.43

Table 20. Energy Use and Operating Costs for Existing Fixtures

Entained Training	Watts per	Lamp Life	Lamp Cost (\$		Coet/1,000	Decreed Lighting Eighting Betroffts
Existing riving 19pe Description	Fixture	(Hours)	Each)	(Hr/Lamp)	Lamp-Hrs	
Exit I-10W - 2 Lamps per Fixture	20.0	131,400	\$2.45	0.083	\$0.032	A: LED Retrofit Kit
Exit LED	1.8	220,000	\$31.50	ΑN	ΑN	NA
F13 Mini-Tube Downlight - 2 Lamps per Fixture	32.0	10,000	\$2.38	ΑN	ΝΑ	NA
F13 Mini-Tube Wall-Mounted - 2 Lamps per Fixture	32.0	10,000	\$2.38	ΑN	ΑN	NA
F20T12 - 1 Lamp per Fixture	12.0	9,000	\$1.18	ΑN	NA	NA
F30T12 - 2 Lamps per Fixture	74.0	AN	AN	ΑN	ΑN	B1: Electronic Ballast, or
F30T12 - 2 Lamps per Fixture	74.0	18,000	\$3.70	0.150	\$0.382	B2: Electronic Ballast & T8 Lamps
F32T8 - 1 Lamp per Fixture (Non-electronic Ballast)	37.0	20,000	\$2.65	Ϋ́	ΝΑ	C1: Electronic Ballast
F32T8 - 2 Lamps per Fixture (Non-electronic Ballast)	71.0	20,000	\$2.65	0.150	\$0.291	C2: Electronic Ballast
F34T12 - 1 Lamps per Fixture	43.0	20,000	\$2.75	0.167	\$0.314	D1: Ballast & T8 Lamps
F34T12 - 2 Lamps per Fixture	72.0	20,000	\$2.75	0.150	\$0.296	D2: Ballast & T8 Lamps
F34T12 - 3 Lemps per Fixture	100.0	20,000	\$2.75	0.135	\$0.280	D3: Ballast & T8 Lamps
F34T12 - 4 Lamps per Fixture	144.0	20,000	\$2.75	0.122	\$0.267	D4: Ballast & T8 Lamps
F40T12 - 1 Lamp per Fixture	20.0	20,000	\$2.75	0.167	\$0.314	D1: Ballest & T8 Lamps
F40T12 - 2 Lamps per Fixture	86.0	20,000	\$2.75	0.150	\$0.298	D2: Ballast & T8 Lamps
F40T12 - 3 Lamps per Fixture	100.0	20,000	\$2.75	0.135	\$0.280	D3: Ballast & T8 Lamps
F40T12 - 4 Lamps per Fixture	172.0	20,000	\$2.75	0.122	\$0.287	D4: Ballast & T8 Lamps & D5: Delamping & Reflector
F40T12 - Wall Surface-Mount Fixture 1 Lamp	20.0	20,000	\$2.75	0.167	\$0.314	D1: Ballast & T8 Lamps
F40T12HO - 2 Lamps per Fixture	145.0	12,000	\$5.51	0.150	\$0.724	E1: Replace Ballast
F40T12U - 2 Lamps per Fixture	72.0	12,000	\$5.62	0.135	\$0.708	E2: Replace T8U Lamps & Ballasts
F40T12U - 3 Lemps per Fixture	100.0	12,000	\$5.62	0.122	\$0.683	E3: Replace T8U Lamps & Ballasts
F96T12 - 2 Lamps per Fixture	158.0	12,000	\$3.63	0.169	\$0.800	F1: Ballasts & T8 Lamps
F96T12 - 4 Lamps per Fixture	316.0	12,000	\$3.63	0.152	\$0.570	F2: Ballasts & T8 Lamps
FC12T9 - 32W Circline	43.0	12,000	\$2.51	0.167	\$0.504	NA
HPS 400W - 1 Lemp per Fixture	457.0	24,000	\$22.86	0.300	\$1.217	NA
I-100W - Ceiling-Mount Fixture 1 Lamp per Fixture	100.0	750	\$0.51	0.083	\$3.021	G5: Compact Fluorescent
I-100W - Pendant, decorative	100.0	750	\$0.51	NA	NA	NA
I-12x5W - Pendant, decorative	0.09	ΑN	ΑN	۷V	NA	NA - decorative
I-40W - Wall Surface-Mount Fixture - 1 Lamp per Fixture	40.0	1,500	\$0.30	0.083	\$1.370	G3: Compact Fluorescent
I-4x100W - Pendant, decorative	400.0	750		ΑN	AN	NA - decorative
I-4x40W - Pendant, decorative	160.0	1,500	\$0.30	ΑN	ΑN	NA - decorative
I-5x40W - Pendant, decorative	200.0	1,500	\$0.30	ΑN	ΑN	NA - decorative
I-5x5W - Pendant, decorative	25.0	NA V	ΝA	ΥN	NA V	NA - decorative
I-60W - Ceiling-Mount Fixture 1 Lamp per Fixture	0.09	1,000		0.083	\$2.265	G4: Compact Fluorescent
I-60W - Desk Lamp	0.09	1,000	\$0.51	0.083	\$2.265	H1: Replace Lamp with Compact Fluorescent
I-60W Par Downlight Fixture	0.09	2,000	\$3.16	0.083	\$2.458	G1: Compact Fluorescent
I-60W - Wall Surface-Mount Fixture	0.09	1,000	\$0.51	0.083	\$2.265	G4: Compact Fluorescent
I-75W - Desk Lamp	75.0	150	\$0.71	0.083	\$3.287	H1: Replace Lamp with Compact Fluorescent
I-75W Par Downlight Fixture	75.0	2,000		0.083	\$3.983	G2: Compact Fluorescent
LPS 180W - 1 Lamp per Fixture	220.0	33,000	\$56.24	NA	NA	NA
LPS 55W - 1 Lamp per Fixture	80.0	8,000	\$30.59	NA	NA	NA
LPS 90W - 1 Lamp per Fixture	125.0	13,500	\$33.98	NA	NA	NA
MV 250W - Pendant-Mount	285.0	24,000	\$31.62	0.300	\$1.582	J1: Replace with HPS Lamp & Ballast
MAY ADDIM - Dandent-Mount	454 0	24.000	\$50.34	008.0	\$2.362	12. Renisce with HPS I amp & Rallest

F:\PROJ\1640313\ENGR\PREFINAL\FORM4283\LITE-ECO.XLS Present Fixtures

Table 21. Energy Use and Operating Costs for Proposed Lighting Fixture Retrofits

Retrofit	ŀ	Watts per	Lamp Life	Lamp Cost	Labor	Cost/1,000
Type	Netront Description	Fixture	(Hours)	(\$ Each)	(Hr/Lamp)	Lamp-Hrs
A	A: LED Retrofit Kit	1.8	220,000	\$31.50	1.000	\$0.239
81	B1: Electronic Ballast, or	61.0	ΑN	ΑN	NA	ΝΑ
B2	B2: Electronic Ballast & T8 Lamps	44.0	20,000	\$2.54	0.150	\$0.286
ភ	C1: Electronic Ballast	31.0	ΥZ	ΑN	NA	ΑN
7	C2: Electronic Ballast	0.09	Ϋ́	Ϋ́	AN	NA
10	D1: Ballast & T8 Lamps	31.0	20,000	\$2.83	0.167	\$0.318
D2	D2: Ballast & T8 Lamps	61.0	20,000	\$2.83	0.150	\$0.300
D3	D3: Ballast & T8 Lamps	93.0	20,000	\$2.83	0.135	\$0.284
D4	D4: Ballast & T8 Lamps	122.0	20,000	\$2.83	0.122	\$0.271
05	D5: Reflector, Delamp to 3 F32T8s & Ballast	93.0	20,000	\$2.83	0.135	\$0.284
E	E1: Replace Ballast	112.0	AN	ΝΑ	AA	ĄZ
E2	E2: Replace T8U Lamps & Ballasts	61.0	20,000	\$9.34	0.135	\$0.610
E3	E3: Replace T8U Lamps & Ballasts	88.0	20,000	\$9.34	0.122	\$0.596
F1	F1: Ballasts & T8 Lamps	118.0	15,000	\$10.28	0.169	\$0.924
F2	F2: Ballasts & T8 Lamps	236.0	15,000	\$10.28	0.152	\$0.900
<b>G1</b>	G1: Compact Flourescent	15.3	10,000	\$5.19	0.083	\$0.695
<b>G2</b>	G2: Compact Fluorescent	20.0	10,000	\$5.19	0.083	\$0.695
63	G3: Compact Fluorescent	8.5	10,000	\$2.49	0.083	\$0.425
64	G4: Compact Flourescent	15.3	10,000	\$5.88	0.083	\$0.764
GE	G5: Compact Fluorescent	23.0	10,000	\$18.07	0.083	\$1.983
H	H1: Replace Lamp with Compact Fluorescent	17.0	10,000	\$11.76	0.083	\$1.352
J1	J1: Replace with HPS Lamp & Ballast	188.0	24,000	\$12.91	0.300	\$0.802
32	J2: Replace with HPS Lamp & Ballast	245.0	24,000	\$16.44	0.300	\$0.949

Location: Fort Huachuca, Arizona Region No. 4 Project No. Project Title: **ECIP Facility Energy Improvements** Fiscal Year FY96 Discrete Portion: Total Successful Lighting Fixture Retrofits & Control Projects Preparer: KELLER & GANNON January 1995 Analysis Date: Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$256,870 B. SIOH \$15,412 C. Design Cost \$15,412 D. Total Cost (1A+1B+1C) \$287,695 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$36,359 G. Total Investment (1D-1E-1F) \$251,336 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Energy Cost Saving Annual \$ Discount Discounted \$/MBTU MBTU/Yr(2) Source Savings(3) Factor(4) Savings(5) A. Elec. \$14.17 1,920 \$27,193 12.02 \$326,858 B. Dist 0 \$0 \$0 C. LPG 0 \$0 \$0 D. Natural Gas \$4.51 0 \$0 14.17 12.02 E. Demand Saved \$127.84 123.6 \$15,804 \$189,959 F. Total 1,920 \$42,996 \$516,817 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) \$4,105 (1) Discount Factor (Table A) 11.94 (2) Discounted Savings/Cost (3A x 3A1) \$49,012 B. Non Recurring Savings (+) or Cost (-) ltem Savings(+) Year of **Discount** Discounted Sav-Occur. (2) Cost(-)(1) Factor(3) ings(+)Cost(-)(4)a. b. c. d. Total C Total Non Energy Discounted Savings (3A2+3Bd4) \$49,012 4. First Year Dollar Savings (3F3 + 3A + (3Bd1/Economic Life)): \$47,101 5. Simple Payback (1G/4): 5.34 Years 6. Total Net Discounted Savings (2F5+3C): \$565,829 7. Savings to Investment Ratio (SIR) (6/1G): 2.25

Location:	Fort Huachuca, Ari	zona	Region No. 4		Project No.	
Project Title:	<b>ECIP Facility Energ</b>	y Improvements			Fiscal Year FY9	6
Discrete Portion:	Fixture Retrofit A - Li	ED Exit Signs			Preparer: KELLER	& GANNON
Analysis Date:	January 1995		Economic Life:	15	Years	
1. Investment Co	osts					
A. Construction	Costs		\$5,723			
B. SIOH			\$343			
C. Design Cost			\$343			
D. Total Cost (1.	A + 1B + 1C)		\$6,410			
E. Salvage Value	of Existing Equipm	ient			\$O	
F. Public Utility	Company Rebate				\$972	
G. Total Investm	ent (1D-1E-1F)					\$5,438
2. Energy Saving	gs ( + )/Cost(-):					
		iscount Factors: Oc	ctober 1994			
Energy	Cost	Saving	Annual \$		Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)		Factor(4)	Savings(5)
A. Elec.	\$14.17	59	\$830		12.02	\$9,979
B. Dist		0	<b>\$0</b>			<b>\$0</b>
C. LPG			\$O			<b>\$0</b>
D. Natural Gas	\$4.51		\$0 ***		14.17	40.000
E. Demand Save	d <u>\$127.84</u>		W \$251		12.02	\$3,020
F. Total		59	\$1,082			\$13,000
3. Non Energy S	avings (+) or Cost	(-):				
A. Annual Recur	ring (+/-)		(\$165)			
(1) Discount Fac	-		(+100)		11.94	
	Savings/Cost (3A x	3A1)				(\$1,975)
B. Non Recurring	g Savings (+) or Co	est (-)				
t.						
item	Savings(+) Cost(-)(1)	Year of	Discount		Discounted Sav-	
	Cost(-)(1)	Occur. (2)	Factor(3)		ings( + )Cost(-)(4)	
a. b.		<del></del>				
c.						
d. Total		<del></del>				
C Total Non Ene	rgy Discounted Sav	ings (3A2+3Bd4)			(\$1,975)	
4 Fi-434 - F-1	La Carta (CEC	04 . (05 14 15				
		3A + (3Bd1/Econo	mic Life)):		\$916 5.04	V
5. Simple Payba		E + 2C).			5.94	Years
	counted Savings (2F				\$11,025 2.03	
7. Savings to Inv	vestment Ratio (SIR	/ (0/ 1 <b>u</b> ):			2.03	

Location: Fort Huachuca, Arizona Region No. 4 Project No. **ECIP Facility Energy Improvements Project Title:** Fiscal Year FY96 Discrete Portion: Fixture Retrofit B2 - Electronic Ballasts & T8 Lamps Preparer: KELLER & GANNON for 2 Lamp F30T12 Fixtures Analysis Date: January 1995 Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$6,020 B. SIOH \$361 C. Design Cost \$361 D. Total Cost (1A + 1B + 1C) \$6,742 E. Salvage Value of Existing Equipment \$0 \$1,240 F. Public Utility Company Rebate G. Total Investment (1D-1E-1F) \$5,502 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Energy Cost Annual \$ Discount Discounted Saving Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. \$14.17 28 \$393 12.02 \$4,722 B. Dist 0 \$0 \$0 C. LPG \$0 \$0 0 D. Natural Gas \$4.51 0 \$0 14.17 \$127.84 E. Demand Saved 3.7 kW \$476 12.02 \$5,716 F. Total 28 \$868 \$10,438 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) \$104 (1) Discount Factor (Table A) 11.94 (2) Discounted Savings/Cost (3A x 3A1) \$1,244 B. Non Recurring Savings (+) or Cost (-) Item Savings(+) Year of Discount Discounted Sav-Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4)b. c. d. Total C Total Non Energy Discounted Savings (3A2+3Bd4) \$1,244 4. First Year Dollar Savings (3F3 + 3A + (3Bd1/Economic Life)): \$973 5. Simple Payback (1G/4): 5.66 Years 6. Total Net Discounted Savings (2F5+3C): \$11,682 7. Savings to Investment Ratio (SIR) (6/1G): 2.12

Location: Project No. Fort Huachuca, Arizona Region No. 4 Project Title: **ECIP Facility Energy Improvements** Fiscal Year FY96 Discrete Portion: Fixture Retrofit D1 - Electronic Ballasts and T8 Lamps Preparer: KELLER & GANNON for 1 Lamp F34T12 & F40T12 Fixtures Analysis Date: January 1995 Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$5,623 B. SIOH \$337 C. Design Cost \$337 D. Total Cost (1A + 1B + 1C) \$6,297 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$1,080 G. Total Investment (1D-1E-1F) \$5,217 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Energy Cost Saving Annual \$ Discount Discounted Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. \$438 \$14.17 31 12.02 \$5,269 B. Dist 0 \$0 \$0 C. LPG 0 \$0 \$0 D. Natural Gas \$4.51 0 \$0 14.17 E. Demand Saved \$127.84 1.7 \$220 12.02 \$2,643 F. Total 31 \$658 \$7,912 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) (\$136)(1) Discount Factor (Table A) 11.94 (2) Discounted Savings/Cost (3A x 3A1) (\$1,626)B. Non Recurring Savings (+) or Cost (-) item Savings(+) Year of Discount Discounted Sav-Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4)a. b. C. d. Total C Total Non Energy Discounted Savings (3A2+3Bd4) (\$1,626)4. First Year Dollar Savings (3F3 + 3A + (3Bd1/Economic Life)): \$522 5. Simple Payback (1G/4): 9.99 Years 6. Total Net Discounted Savings (2F5+3C): \$6,286 7. Savings to Investment Ratio (SIR) (6/1G): 1.20

Location:	Fort Huachuca, Ari	zona	Region No. 4	Project No.	
Project Title:	<b>ECIP Facility Energ</b>	y Improvements		Fiscal Year FYS	96
Discrete Portion:	Fixture Retrofit D2 - for 2 Lamp F34T12		nd T8 Lamps	Preparer: KELLER	& GANNON
Analysis Date:	January 1995		Economic Life:	15 Years	
1. Investment C	osts				
A. Construction			\$72,535		
B. SIOH	0000		\$4,352		
C. Design Cost			\$4,352		
D. Total Cost (1	A+1B+1C)		\$81,239		
•	of Existing Equipm	ent	101,200	\$O	
	Company Rebate			\$14,010	-
G. Total Investm					- \$67,229
					107,220
2. Energy Saving					
Date of NISTIR 8	35-3273 Used for D	iscount Factors: C	ctober 1994		
Energy	Cost	Saving	Annual \$	Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)
A 71	A14 17	000	45.007		
A. Elec. B. Dist	\$14.17	368	\$5,207	12.02	\$62,592
C. LPG		0	\$0 \$0		\$O
D. Natural Gas	\$4.51	0	\$0 \$0	14.17	<b>\$0</b>
E. Demand Save			<w \$3,839<="" td=""><td><u>14.17</u> 12.02</td><td>\$46,141</td></w>	<u>14.17</u> 12.02	\$46,141
F. Total		368	\$9,046	12.02	\$108,733
		000	¥0,040		¥100,733
3. Non Energy S	savings (+) or Cost	(-):			
A. Annual Recur	ring (+/-)		(\$48)		
(1) Discount Fac	tor (Table A)			11.94	
(2) Discounted S	Savings/Cost (3A x 3	3A1)			(\$569)
B. Non Recurring	g Savings (+) or Co	st (-)			
Item	Savings(+)	Year of	Discount	Discounted Sav-	
	Cost(-)(1)	Occur. (2)	Factor(3)	ings(+)Cost(-)(4)	
a.			, 45151,6,		
b.					
c.					
d. Total					
C Total Non Ene	rgy Discounted Sav	ings (3A2+3Bd4)		(\$569)	
4. First Year Dol	lar Savings (3F3 +	3A + (3Bd1/Econe	omic Life)):	\$8,998	
5. Simple Payba				7.47	Years
6. Total Net Disc	counted Savings (2F	5+3C):		\$108,164	
	vestment Ratio (SIR			1 81	

Location: Project Title:	Fort Huachuca, Arizona Region No. 4 ECIP Facility Energy Improvements			Project No. Fiscal Year	EVOR
•	Fixture Retrofit D5 -		- 4 Lama F24T12 8		FY96
Discible Fortion.		3 x F32T8 Lamps ar		Preparer: KEL	LER & GANNON
Analysis Date:	January 1995	•	Economic Life:	15 Years	
1. Investment C	osts				
A. Construction	Costs		\$50,250		
B. SIOH			\$3,015		
C. Design Cost			\$3,015		
D. Total Cost (1	A + 1B + 1C)		\$56,280		
E. Salvage Value	of Existing Equipm	ent		\$0	
F. Public Utility	Company Rebate			\$12,749	<del></del>
G. Total Investm	nent (1D-1E-1F)				\$43,531
2	( - ) ( ( )				
2. Energy Saving		·	1004		
Date of NISTIR	85-3273 Used for D	iscount Factors: O	ctober 1994		
Energy	Cost	Saving	Annual \$	Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)
				1 40101(1)	Cavingo(o)
A. Elec.	\$14.17	493	\$6,989	12.02	\$84,004
B. Dist		0	<b>\$</b> 0		_ \$0
C. LPG		0	<b>\$0</b>		\$0
D. Natural Gas	\$4.51	0	<b>\$</b> 0	14.17	
E. Demand Save	ed \$127.84	49.3	kW \$6,308	12.02	_ \$75,819
F. Total		493	\$13,296		\$159,823
					·
3. Non Energy S	savings (+) or Cost	(-):			
A A					
A. Annual Recur			<u> </u>		
(1) Discount Fac	• • • •			11.94	_
(2) Discounted S	Savings/Cost (3A x 3	SA 1)			\$5,930
B. Non Recurring	g Savings (+) or Co	st (-)			
ltem	Savings(+)	Year of	Discount	D:	
110111	Cost(-)(1)			Discounted S	
	COSt(-)(1)	Occur. (2)	Factor(3)	ings(+)Cost(-	·)(4)
a. b.					
с.					<del>_</del>
d. Total					=
a. Iotai					
C Total Non Ene	rgy Discounted Savi	ngs (3A2+3Bd4)		\$5,930	
4. First Year Dol	lar Savings (3F3 +	3A + (3Bd1/Econo	omic Life)):	\$13,793	
5. Simple Payba		,,	=,.	3.16	
	counted Savings (2F	5+3C):		\$165,753	
	vestment Ratio (SIR)			3.81	

Location:	Fort Huachuca, Ari	zona	Region No. 4	Project No.			
Project Title:	ECIP Facility Energ	•		Fiscal Year FY	96		
Discrete Portion:	Fixture Retrofit E1 - E	lectronic Ballasts		Preparer: KELLER	& GANNON		
	for 2 Lamp F48T12	HO Fixtures					
Analysis Date:	January 1995		Economic Life:	15 Years			
1. Investment C							
A. Construction	Costs		\$2,052				
B. SIOH			\$123				
C. Design Cost			\$123				
D. Total Cost (1			\$2,299				
	of Existing Equipm	ent		\$0	_		
	Company Rebate			\$192	<u> </u>		
G. Total Investm	ent (1D-1E-1F)				\$2,107		
2. Energy Saving	ro ( + VCoot( )						
		iscount Factors: Oc	tobar 1994				
Date of Misting	33-3273 Used for D	iscount Factors: Oc	Rober 1994				
Energy	Cost	Saving	Annual \$	Discount	Discounted		
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)		
	.,,,,,	,	outgo(o)	, 4010, ( ) ,	carmigo(o)		
A. Elec.	\$14.17	19	\$265	12.02	\$3,191		
B. Dist		0	<b>\$</b> 0		<b>\$</b> 0		
C. LPG		0	\$O		\$0		
D. Natural Gas	\$4.51	0	<b>\$</b> 0	14.17			
E. Demand Save	d \$127.84	1.6 k\	N \$202	12.02	\$2,434		
F. Total		19	\$468		\$5,625		
3. Non Energy S	avings (+) or Cost	(-):					
A. Annual Recur	-		<u></u> \$0				
(1) Discount Fac				11.94			
(2) Discounted S	savings/Cost (3A x 3	3A1)			<b>\$</b> 0		
B. Non Hecurring	3 Savings (+) or Co	st (-)					
leann	Savinas ( )	V	D'	D:			
Item	Savings(+) Cost(-)(1)	Year of	Discount	Discounted Sav-			
	Cost(-)(1)	Occur. (2)	Factor(3)	ings( + )Cost(-)(4	)		
a. b.							
c.							
d. Total							
a. Iotai							
C Total Non Ene	rgy Discounted Sav	ings (3A2+3Bd4)		\$O			
4 50 . 34 50 50		0.4					
	_	3A + (3Bd1/Econor	mic Lite)):	\$468			
5. Simple Payba		'E + 20\		4.50	Years		
	counted Savings (2F vestment Ratio (SIR)			\$5,625 2.87			
. Javinus lu inv	MC) Ulba ilibilioov	1 (U/ 1 U/):		2.67			

Location:	Fort Huachuca, Ariz	ona	Region No. 4		Project No.	
Project Title:	<b>ECIP Facility Energy</b>	Improvements			Fiscal Year FY9	6
Discrete Portion:	Fixture Retrofit F1 - El	ectronic Ballasts and	I T8 Lamps		Preparer: KELLER	& GANNON
	for 2 Lamp F96T12 I	Fixtures				
Analysis Date:	January 1995		Economic Life:	15	Years	
1. Investment C						
A. Construction	Costs		\$1,805			
B. SIOH			\$108			
C. Design Cost			\$108			
D. Total Cost (1			\$2,022			
	of Existing Equipme	ent			\$0	•
	Company Rebate				\$200	•
G. Total Investm	nent (1D-1E-1F)					\$1,822
2 F Ci-	( . ) (04/ )					
2. Energy Saving	gs (+)/Cost(-): 35-3273 Used for Di	Pagunt Factors. O	-tabar 1004			
Date of MSTIN	55-32/3 Used for Di	scount ractors: Of	Ctober 1994			
Energy	Cost	Saving	Annuai \$		Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)		Factor(4)	Savings(5)
			<b>g</b> -(-,			outiligate,
A. Elec.	\$14.17	6.39	\$91		12.02	\$1,088
B. Dist		0.00	\$O			\$0
C. LPG		0.00	\$O			\$0
D. Natural Gas	\$4.51	0.00	<b>\$</b> O		14.17	
E. Demand Save			W\$102		12.02	\$1,229
F. Total		6.39	\$193			\$2,317
3. Non Energy S	avings (+) or Cost (	-):				
A. Annual Recur			(\$32)			
(1) Discount Fac					11.94	
(2) Discounted S	Savings/Cost (3A x 3	A1)				(\$385)
B. Non Recurring	g Savings (+) or Cos	it (-)				
Item	Savings(+)	Year of	Discount		Discounted Sav-	
TOTAL STATE OF THE	Cost(-)(1)	Occur. (2)	Factor(3)			
a.	C08((-)(1)	Occur. (2)	ractor(3)		ings(+)Cost(-)(4)	
b.						
c.						
d. Total						
d. Total						
C Total Non Ene	rgy Discounted Savi	ngs (3A2+3Bd4)			(\$385)	
4 5						
	llar Savings (3F3 + 3	SA + (3Bd1/Econo	mic Life)}:		\$161	
5. Simple Payba					11.35	Years
	counted Savings (2F)				\$1,932	
A. DEVINGS TO IN	vestment Ratio (SIR)	(0/16):			1.08	

Location:	Fort Huachuca, Arizona Region No. 4			Project No.		
Project Title:	ECIP Facility Energ	y Improvements		Fiscal Year FYS	96	
Discrete Portion:	Fixture Retrofit F2 - for 4 Lamp F96T12	Electronic Ballasts ar 2 Fixtures	nd T8 Lamps	Preparer: KELLER	& GANNON	
Analysis Date:	January 1995		Economic Life:	15 Years		
1. Investment Co	osts					
A. Construction	Costs		\$181			
B. SIOH			\$11			
C. Design Cost			\$11			
D. Total Cost (1)			\$202			
	of Existing Equipn	nent		<b>\$</b> 0	_	
F. Public Utility (	•			\$20	_	
G. Total Investm	ent (1D-1E-1F)				\$182	
2. Energy Saving	ıs (+)/Cost(-):					
		Discount Factors: C	October 1994			
Energy	Cost	Saving	Annual \$	Diagonat	Discounted	
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Discount Factor(4)		
000100	¥/W.D.1.G	141610/11(2/	Savings(S)	Factor(4)	Savings(5)	
A. Elec.	\$14.17	0.57	\$8	12.02	\$97	
B. Dist		0.00	<b>\$</b> 0		\$O	
C. LPG		0.00	<b>\$</b> 0		\$O	
D. Natural Gas	\$4.51	0.00	<b>\$</b> 0	14.17		
E. Demand Save	d \$127.84	0.08	kW\$10	12.02	\$123	
F. Total		0.57	\$18		\$220	
3. Non Energy S	avings (+) or Cost	(-):				
A. Annual Recur	ring (+/-)		(\$3)			
(1) Discount Fac	tor (Table A)			11.94		
(2) Discounted S	avings/Cost (3A x	3A1)			(\$33)	
B. Non Recurring	Savings (+) or Co	ost (-)				
ltem	Savings(+)	Year of	Discount	Discounted Sav-		
TOTAL	Cost(-)(1)	Occur. (2)	Factor(3)			
a.	0081(-)(1)	Occur. (2)	ractor(3)	ings(+)Cost(-)(4)		
b.	-					
c.						
d. Total						
C Total Non Ene	rgy Discounted Sav	vings (3A2+3Bd4)		(\$33)		
4 Finak V 5 "		0.4				
		3A + (3Bd1/Econo	omic Life)):	\$16		
5. Simple Paybac		EE + 201.		11.73	Years	
	ounted Savings (2)			\$187		
7. Savings to inv	estment Ratio (SIR	(b/1G):		1.03		

Location:	Fort Huachuca, Ar	izona	Region No. 4		Project No.	
Project Title:	ECIP Facility Energ	y Improvements			Fiscal Year FYS	96
Discrete Portion:		Compact Fluorescent			Preparer: KELLER	& GANNON
Analysis Date:	January 1995	Tariff Tixtaro	Economic Life:	15	Years	
	·					
1. Investment C	osts					
A. Construction	Costs		\$42			
B. SIOH			\$2			
C. Design Cost			\$2			
D. Total Cost (1	A + 1B + 1C)		\$47			
E. Salvage Value	of Existing Equipm	nent			<b>\$</b> 0	_
F. Public Utility	Company Rebate				\$10	
G. Total Investm	nent (1D-1E-1F)					\$37
2. Energy Saving	as (+)/Cost(-)·					
		Discount Factors: Oc	tober 1994			
Energy	Cost	Saving	Annual \$		Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)		Factor(4)	Savings(5)
A. Elec.	\$14.17	0.48	\$7		12.02	\$81
B. Dist		0.00	\$O			\$O
C. LPG		0.00	<b>\$</b> O			\$O
D. Natural Gas	\$4.51	0.00	\$O		14.17	
E. Demand Save	d \$127.84	0.09 k	W\$11		12.02	\$137
F. Total		0.48	\$18			\$218
3. Non Energy S	savings (+) or Cost	(-)·				
		<u> </u>				
A. Annual Recur	ring (+/-)		\$7			
(1) Discount Fac	tor (Table A)				11.94	
(2) Discounted S	Savings/Cost (3A x	3A1)				\$88
B. Non Recurring	g Savings (+) or Co	est (-)				
14	Contract ()					
Item	Savings(+) Cost(-)(1)	Year of	Discount		Discounted Sav-	
•	Cost(-)(1)	Occur. (2)	Factor(3)		ings(+)Cost(-)(4)	
a. b.						
С.						
d. Total						
u. Total						
C Total Non Ene	rgy Discounted Sav	ings (3A2+3Bd4)			\$88	
4. First Year Dol	lar Savings (3F3 +	3A + (3Bd1/Econor	mic Life)):		\$26	
5. Simple Payba	ck (1G/4):				1.44	Years
6. Total Net Disc	counted Savings (2)	5 + 3C):			\$306	
7. Savings to Inv	vestment Ratio (SIR	) (6/1G):			8.36	

Location:	Fort Huachuca, Arizona Region No. 4			Project No.		
Project Title:	ECIP Facility Energ	y improvements		Fiscal Year FY9	96	
Discrete Portion:	Fixture Retrofit G2 -	Compact Fluorescen	nt TRI 20W	Preparer: KELLER	& GANNON	
	for Incandescent La	mp Fixtures				
Analysis Date:	January 1995		Economic Life:	15 Years		
1. Investment C	osts					
A. Construction	··		\$87			
B. SIOH			\$5			
C. Design Cost			\$5			
D. Total Cost (1	A+1B+1C)		\$97			
E. Salvage Value	of Existing Equipm	nent		<b>\$</b> 0		
F. Public Utility	Company Rebate			\$35	•	
G. Total Investm	nent (1D-1E-1F)				\$62	
2. Energy Savin	as (+)/Cost(-):					
	85-3273 Used for D	Discount Factors: (	October 1994			
<b>F</b>						
Energy	Cost	Saving	Annual \$	Discount	Discounted	
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)	
A. Elec.	\$14.17	15.52	\$220	12.02	\$2,642	
B. Dist		0.00	<b>\$</b> O		<b>\$</b> O	
C. LPG		0.00	<b>\$</b> 0		\$O	
D. Natural Gas	\$4.51	0.00	<b>\$</b> O	14.17		
E. Demand Save	d \$127.84	2.37	kW\$303	12.02	\$3,642	
F. Total		15.52	\$523		\$6,284	
3. Non Energy S	Savings (+) or Cost	(-):				
A Appual Bass	min = 1 + 1 \		4070			
A. Annual Recur	=		<u>\$278</u>	44.04		
	Savings/Cost (3A x :	3A1)		11.94	\$3,313	
		,			45,515	
B. Non Recurring	g Savings (+) or Co	st (-)				
Item	Savings(+)	Year of	Discount	Discounted Sav-		
	Cost(-)(1)	Occur. (2)	Factor(3)	ings(+)Cost(-)(4)		
a.						
b.						
c.						
d. Total						
C Total Non Ene	rgy Discounted Sav	ings (3A2+3Bd4)		\$3,313		
4. First Year Dol	lar Savings (3F3 +	3A + (3Bd1/Econe	omic Life)):	\$800		
5. Simple Payba				0.08	Years	
	counted Savings (2F	5+3C):		\$9,598	. 5410	
	vestment Ratio (SIR			153.60		

Location: Fort Huachuca, Arizona Region No. 4 Project No. **Project Title: ECIP Facility Energy Improvements** Fiscal Year FY96 Discrete Portion: Fixture Retrofit G3 - Compact Fluorescent TT 7W Preparer: KELLER & GANNON for Incandescent Lamp Fixtures Analysis Date: January 1995 Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$1,242 B. SIOH \$75 C. Design Cost \$75 D. Total Cost (1A+1B+1C) \$1,391 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$225 G. Total Investment (1D-1E-1F) \$1,166 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Energy Cost Saving Annual \$ Discount Discounted Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. 15.32 \$217 12.02 \$14.17 \$2,608 B. Dist 0.00 \$0 \$0 C. LPG 0.00 \$0 \$0 D. Natural Gas \$4.51 0.00 \$0 14.17 E. Demand Saved \$127.84 2.36 \$302 12.02 \$3.630 F. Total 15.32 \$519 \$6,239 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) \$246 (1) Discount Factor (Table A) 11.94 (2) Discounted Savings/Cost (3A x 3A1) \$2,936 B. Non Recurring Savings (+) or Cost (-) ltem Savings(+) Year of Discount Discounted Sav-Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4)a. h d. Total C Total Non Energy Discounted Savings (3A2+3Bd4) \$2,936 4. First Year Dollar Savings (3F3 + 3A + (3Bd1/Economic Life)): \$765 5. Simple Payback (1G/4): 1.52 Years 6. Total Net Discounted Savings (2F5+3C): \$9,175 7. Savings to Investment Ratio (SIR) (6/1G): 7.87

Location: Fort Huachuca, Arizona Region No. 4 Project No. **Project Title: ECIP Facility Energy Improvements** Fiscal Year FY96 Discrete Portion: Fixture Retrofit G4 - Compact Fluorescent DTT 13W Preparer: KELLER & GANNON for Ceiling Mounted Incandescent Lamp Fixtures Analysis Date: January 1995 Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$988 B. SIOH \$59 C. Design Cost \$59 D. Total Cost (1A+1B+1C) \$1,106 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$230 G. Total Investment (1D-1E-1F) \$876 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Energy Cost Saving Annual \$ Discount Discounted Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. \$14.17 12.92 \$183 12.02 \$2,201 B. Dist 0.00 \$0 \$0 C. LPG 0.00 \$0 \$0 D. Natural Gas \$4.51 0.00 \$0 14.17 E. Demand Saved \$127.84 2.06 \$263 12.02 \$3,160 F. Total 12.92 \$446 \$5,360 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) \$147 (1) Discount Factor (Table A) 11.94 (2) Discounted Savings/Cost (3A x 3A1) \$1,757 B. Non Recurring Savings (+) or Cost (-) Item Savings(+) Year of **Discount** Discounted Sav-Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4)a. h c. d. Total C Total Non Energy Discounted Savings (3A2+3Bd4) \$1,757 4. First Year Dollar Savings (3F3 + 3A + (3Bd1/Economic Life)): \$593 5. Simple Payback (1G/4): Years 1.48 6. Total Net Discounted Savings (2F5+3C): \$7,117 7. Savings to Investment Ratio (SIR) (6/1G): 8.12

Location:	Fort Huachuca, Aria	zona	F	legion No. 4		Project No.	
Project Title:	ECIP Facility Energy	y Improvements				Fiscal Year FY9	96
Discrete Portion:	Fixture Retrofit G5 - 0	Compact Fluoresce	nt TRI	23W		Preparer: KELLER	& GANNON
	for Incandescent Lar	mp Fixtures					
Analysis Date:	January 1995		Ε	conomic Life:	15	Years	
1 Investment C							
1. Investment C A. Construction				4022			
B. SIOH	Costs			\$932 \$56			
C. Design Cost				\$56			
D. Total Cost (1	Δ ± 1R ± 1C)		=	\$1,044			
	of Existing Equipm	ent		V1,044		\$O	
	Company Rebate	0111				\$150	-
G. Total Investm	* *					<del>- 100</del>	- \$894
							V034
2. Energy Savin	gs (+)/Cost(-):						
Date of NISTIR	85-3273 Used for D	iscount Factors:	Octobe	er 1994			
Energy	Cost	Saving		Annual \$		Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)		Savings(3)		Factor(4)	Savings(5)
	,,,,,,	101210711(2)		Odvings(O)		r actor(+)	Savinga(S)
A. Elec.	\$14.17	16.95		\$240		12.02	\$2,885
B. Dist		0.00	•	\$O			<b>\$</b> 0
C. LPG		0.00	•	\$O			<b>\$</b> 0
D. Natural Gas	\$4.51	0.00		\$O		14.17	
E. Demand Save	d \$127.84	2.31	kW_	\$295		12.02	\$3,550
F. Total		16.95		\$535			\$6,435
3. Non Energy S	Savings (+) or Cost	(-):					
A. Annual Recur	<del>-</del>			(\$88)			
(1) Discount Fac						11.94	
(2) Discounted S	Savings/Cost (3A x 3	3A1)					(\$1,049)
B. Non Recurring	g Savings (+) or Co	st (-)					
ltem	Savings(+)	Year of	ח	iscount		Discounted Sav-	
	Cost(-)(1)	Occur. (2)		actor(3)		ings(+)Cost(-)(4)	
a.			•			go( . / 000t( /( //	
b.			•				
c.			•				
d. Total							
C Total Non Ene	rgy Discounted Savi	ngs (3A2+3Bd4)	)			(\$1,049)	
	lar Savings (3F3 +	3A + (3Bd1/Ecor	nomic I	Life)):		\$448	
5. Simple Payba		-				2.00	Years
	counted Savings (2F					\$5,386	
7. Savings to Inv	vestment Ratio (SIR)	(6/1G):				8.02	

Location:	Fort Huachuca, Ari	zona	Region No. 4	Project No.	
Project Title:	<b>ECIP Facility Energ</b>	y Improvements		Fiscal Year FY	'96
Discrete Portion:		Compact Fluorescent	17W	Preparer: KELLE	R & GANNON
	for Incandescent Ta	ble Lamps			
Analysis Date:	January 1995		Economic Life:	15 Years	
1. Investment C	osts				
A. Construction			\$5,465		
B. SIOH			\$328		
C. Design Cost			\$328		
D. Total Cost (1	A+1B+1C)		\$6,121		
E. Salvage Value	of Existing Equipm	ent		<b>\$</b> 0	
F. Public Utility	Company Rebate			\$1,245	
G. Total Investm	nent (1D-1E-1F)				\$4,876
	4.346.343				
2. Energy Saving		viscount Factors: Od			
Date of NISTIN 6	35-32/3 Osed for D	iscount Factors: Of	Clober 1994		
Energy	Cost	Saving	Annual \$	Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)
A. Elec.	\$14.17	79.81	\$1,131	12.02	\$13,590
B. Dist		0.00	<b>\$0</b>		<b>\$0</b>
C. LPG	A4.51	0.00	\$O	4447	<b>\$</b> 0
D. Natural Gas E. Demand Save	\$4.51 ed \$127.84	0.00	\$0 W \$1,369	14.17	61 <i>0 4</i> E2
F. Total	3127.04			12.02	\$16,453
r. Total		79.81	\$2,499		\$30,043
3. Non Energy S	savings (+) or Cost	(-):			
A. Annual Recui			\$994		
(1) Discount Fac		0.4.4.1		11.94	444.000
(2) Discounted S	Savings/Cost (3A x	3A1)			\$11,868
B. Non Recurring	g Savings (+) or Co	est (-)			
Item	Savings(+)	Year of	Discount	Discounted Sav	
110111	Cost(-)(1)	Occur. (2)	Factor(3)		
a.	C08((-)(1)	Occur. (2)	ractor(3)	ings( + )Cost(-)(4	+1
b.					
c.				· · · · · · · · · · · · · · · · · · ·	
d. Total					
C Total Non Ene	orgy Discounted Sav	ings (3A2+3Bd4)		\$11,868	
		_ · · · · · · · · · · · · · · · · · · ·		, 2 2 2	
4. First Year Do	llar Savings (3F3 +	3A + (3Bd1/Econo	mic Life)):	\$3,493	
5. Simple Payba				1.40	Years
6. Total Net Dis	counted Savings (2	=5 + 3C):		\$41,911	
7. Savings to In	vestment Ratio (SIR	) (6/1G):		8.60	

Location:	Fort Huachuca, Ari	zona	Region No. 4	F	roject No.	
Project Title:	<b>ECIP Facility Energ</b>	y Improvements		F	Fiscal Year FY9	6
Discrete Portion:		150W High Pressure S in 250W MV Lamp Fi	•	I	Preparer: KELLER	& GANNON
Analysis Date:	January 1995		Economic Life:	15 `	l'ears	
1. Investment Co	nsts					
A. Construction	<del></del>		\$6,150			
B. SIOH	0000		\$369			
C. Design Cost			\$369			
D. Total Cost (1.	A + 1B + 1C)		\$6,888			
	of Existing Equipm	nent	40,000		<b>\$</b> 0	
F. Public Utility				_	\$320	-
G. Total Investm	• •			_		\$6,568
2. Energy Saving	gs (+)/Cost(-):					
Date of NISTIR 8	35-3273 Used for D	Discount Factors: O	ctober 1994			
Energy	Cost	Saving	Annual \$		Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)		Factor(4)	Savings(5)
A. Elec.	\$14.17	18.59	\$263	_	12.02	\$3,166
B. Dist		0.00	<b>\$0</b>	_		<b>\$0</b>
C. LPG		0.00	<b>\$0</b>	_	<del> </del>	<b>\$</b> O
D. Natural Gas	\$4.51	0.00	\$0	-	14.17	
E. Demand Save	d \$127.84		W \$409	_	12.02	\$4,919
F. Total		18.59	\$673			\$8,085
3. Non Energy S	avings (+) or Cost	(-):				
A. Annual Recur	ring ( + /-)		<b>\$54</b>			
(1) Discount Fac	_				11.94	
	Savings/Cost (3A x	3A1)		_	11.04	\$639
B. Non Recurring	g Savings (+) or Co	ost (-)				
l <b>4</b>	Continue ( )	V	<b>5</b> .			
ltem	Savings(+)	Year of	Discount		Discounted Sav-	
	Cost(-)(1)	Occur. (2)	Factor(3)	ı	ngs( + )Cost(-)(4)	
a. b.				_		
c.				-		
d. Total				=		
d. Total						
C Total Non Ene	rgy Discounted Sav	rings (3A2+3Bd4)			\$639	
4. First Year Dol	llar Savings (3F3 +	3A + (3Bd1/Econo	omic Life)):		\$726	
5. Simple Payba	ck (1G/4):				9.05	Years
6. Total Net Disc	counted Savings (2	F5 + 3C):			\$8,724	
7. Savings to In	vestment Ratio (SIF	(6/1G):			1.33	

Location: Region No. 4 Fort Huachuca, Arizona Project No. **Project Title: ECIP Facility Energy Improvements** Fiscal Year FY96 Discrete Portion: Fixture Retrofit J2 - 200W High Pressure Sodium Lamp Preparer: KELLER & GANNON and Ballast Retrofit in 400W MV Lamp Fixtures Analysis Date: January 1995 Economic Life: 15 Years 1. Investment Costs A. Construction Costs \$8,496 B. SIOH \$510 C. Design Cost \$510 D. Total Cost (1A+1B+1C) \$9,516 E. Salvage Value of Existing Equipment \$0 F. Public Utility Company Rebate \$1,129 G. Total Investment (1D-1E-1F) \$8,387 2. Energy Savings (+)/Cost(-): Date of NISTIR 85-3273 Used for Discount Factors: October 1994 Annual \$ Energy Cost Saving Discount Discounted Source \$/MBTU MBTU/Yr(2) Savings(3) Factor(4) Savings(5) A. Elec. 12.02 \$14.17 80.12 \$1,135 \$13,643 B. Dist 0.00 \$0 \$0 C. LPG 0.00 \$0 \$0 D. Natural Gas \$4.51 0.00 \$0 14.17 E. Demand Saved \$127.84 11.29 12.02 \$1,443 \$17,342 F. Total 80.12 \$2,578 \$30,985 3. Non Energy Savings (+) or Cost (-): A. Annual Recurring (+/-) \$159 (1) Discount Factor (Table A) 11.94 (2) Discounted Savings/Cost (3A x 3A1) \$1,894 B. Non Recurring Savings (+) or Cost (-) Savings(+) Item Year of **Discount** Discounted Sav-Cost(-)(1) Occur. (2) Factor(3) ings(+)Cost(-)(4) Я. b. c. d. Total C Total Non Energy Discounted Savings (3A2+3Bd4) \$1,894 4. First Year Dollar Savings (3F3 + 3A + (3Bd1/Economic Life)): \$2,736 5. Simple Payback (1G/4): 3.06 Years 6. Total Net Discounted Savings (2F5+3C): \$32,880 3.92 7. Savings to Investment Ratio (SIR) (6/1G):

Location:	Fort Huachuca, Ar	izona	Region No. 4	Pro	oject No.	
Project Title:	ECIP Facility Energ	y improvements		Fis	cal Year FYS	96
Discrete Portion:		<ul> <li>Ceiling Mounted Pass</li> <li>to Control Lighting</li> </ul>	ssive Infrared	Pre	parer: KELLER	& GANNON
Analysis Date:	January 1995		Economic Life:	15 Ye	ars	
1. Investment Co						
A. Construction	Costs		\$72,674			
B. SIOH			\$4,360			
C. Design Cost			\$4,360			
D. Total Cost (1)	•		\$81,395			
	of Existing Equipn	nent			\$0	_
F. Public Utility (	· ·				\$1,784	-
G. Total Investm	ent (1D-1E-1F)					\$79,611
2. Energy Saving	gs (+)/Cost(-):					
		Discount Factors: O	ctober 1994			
Energy	Cost	Saving	Annual \$		Discount	Discounted
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)		Factor(4)	Savings(5)
	,,,,,,		outgo(o)		1 40(01(4)	odvings(o)
A. Elec.	\$14.17	556	\$7,877		12.02	\$94,679
B. Dist		0.00	<b>\$</b> 0			<b>\$</b> 0
C. LPG		0.00	<b>\$</b> 0			<b>\$</b> 0
D. Natural Gas	\$4.51	0.00	<b>\$</b> O		14.17	
E. Demand Save	d \$127.84	0 k	(W\$0		12.02	\$0
F. Total		556	\$7,877			\$94,679
3. Non Energy S	avings (+) or Cost	(-):				
A. Annual Recur	=		\$1,676			
(1) Discount Fac	tor (Table A)				11.94	
(2) Discounted S	avings/Cost (3A x	3A1)				\$20,007
B. Non Recurring	savings (+) or Co	ost (-)				
Item	Savings(+)	Year of	Discount	Dis	scounted Sav-	
	Cost(-)(1)	Occur. (2)	Factor(3)		s(+)Cost(-)(4)	
8.		<b>(-</b> )			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
b.						
c.						
d. Total				-		
C Total Non Ene	rgy Discounted Sav	vings (3A2+3Bd4)			\$20,007	
4 First Vaar Dal	ler Sevinge /2E2	3A + (3Bd1/Econo	omia Lifalle		éo EEO	
5. Simple Payba		OM T (SEGI/ECONO	лис шед:		\$9,552 8.33	Vacro
	ck (1G/4): :ounted Savings (2	EE + 2C).			8.33	Years
	:ounted Savings (2 /estment Ratio (SIR				\$114,686 1.44	
. Savings to Int	resument usno (214	() (O) (G):			1.44	

Location: Project Title:	Fort Huachuca, Arizona  ECIP Facility Energy Improvements		Region No. 4	Project No. Fiscal Year FY96		
-	-	· · Wall Switch Type Pas	ssive Infrared Type	Preparer: KELLER		
			Relatively Small Rooms	· •		
Analysis Date:	January 1995		Economic Life: 15	Years		
1. Investment C	osts					
A. Construction	Costs		\$16,605			
B. SIOH			\$996			
C. Design Cost			\$996			
D. Total Cost (1	A+1B+1C)		\$18,597			
E. Salvage Value	of Existing Equipm	ent		<u></u> \$0		
F. Public Utility	Company Rebate			\$768		
G. Total Investm	nent (1D-1E-1F)				\$17,829	
2. Energy Savin	gs ( + )/Cost(-):					
Date of NISTIR	35-3273 Used for D	iscount Factors: Oct	tober 1994			
Energy	Cost	Saving	Annual \$	Discount	Discounted	
Source	\$/MBTU	MBTU/Yr(2)	Savings(3)	Factor(4)	Savings(5)	
A. Elec.	\$14.17	119.9	\$1,699	12.02	\$20,421	
B. Dist		0.00	<b>\$</b> 0		\$O	
C. LPG		0.00	\$O		<b>\$</b> O	
D. Natural Gas	\$4.51	0.00	<b>\$</b> O	14.17		
E. Demand Save	d \$127.84	0 kV	V\$0	12.02	\$0	
F. Total		119.9	\$1,699		\$20,421	
3. Non Energy S	savings (+) or Cost	(-):				
A. Annual Recui	ring (+/-)		\$416			
(1) Discount Fac	_		7710	11.94		
	Savings/Cost (3A x 3	3A1)			\$4,972	
B. Non Recurring	g Savings (+) or Co	st (-)				
Item	Savings(+)	Year of	Discount	Discounted Sav-		
	Cost(-)(1)	Occur. (2)	Factor(3)	ings(+)Cost(-)(4)		
a.						
b.		-				
c.						
d. Total						
C Total Non Ene	rgy Discounted Savi	ings (3A2+3Bd4)		\$4,972		
4. First Year Do	lar Savings (3F3 +	3A + (3Bd1/Econon	nic Life)):	\$2,115		
5. Simple Payba				8.43	Years	
	counted Savings (2F	5 + 3C):		\$25,393		
7. Savings to In	vestment Ratio (SIR)	) (6/1G):		1.42		

				Date Prepa	red	Sheet	of
CONSTRUCTION COST ESTIMATE				1	ry 1995	1	6
Project ECIP Facility Energy Improvements				Project No.	Basis for Es	stimate	
Location				<u> </u>	†		
Fort Huachuca, Arizona					Code A (no	design com	peted)
Engineer-Architect						-	
Keller & Gannon Drawing No.		1 <del>6</del>					
Lighting ECO Unit Costs		Estimate	or BIH		Checked By		
Lighting LCO Offit Costs	Quar	ntity		bor	Ma	RCL	т
Line Item	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	Total Cost
A. Exit Light LED Retrofit		*		<u> </u>			
LED Retrofit Kit: 120V=6240-01-381-1957; or	· .						T
LED Retrofit Kit: 277V=6240-01-381-2061	1	EA	\$5.29	\$5.29	\$31.50	\$31.50	\$36.79
Arizona Transaction Privilege Tax	3.75%	%		-		\$1.18	\$1.18
Subtotal				-		1	\$37.97
Contractor OH & Profit	25.0%	%			<u> </u>		\$9.49
Subtotal							\$47.46
Bond	1.5%	%					\$0.71
Subtotal	1.070	1					\$48.17
Estimating Contingency	10.0%	%					\$4.82
Total Probable Construction Cost	10.070	للتنا	including	\$9.00	rebate pe	ar fivtura	\$52.99
B2. F30T12, 2 Lamp Fixtures: Repla	ice Exi					or mature	402.55
Electronic Ballast:120V=6250-01-377-6272:	TOO EXI	July 1	Lamps	Ind Dan	1313	1	I
or Electronic Ballast:277V=6250-01-378-8760	1 1	l ea l	\$5.29	\$5.29	\$20.00	\$20.00	\$25.29
or Equal			7-1-1	45.25	120.00	*==::55	<b>VL</b> 3.23
Lamps: F25T8 Philips 32298-2	2	EA	Inclu	ıded	\$4.22	\$8.43	\$8.43
Subtotal				\$5.29		\$28.43	\$33.72
Arizona Transaction Privilege Tax	3.75%	%		-		\$1.07	\$1.07
Subtotal							\$34.78
Contractor OH & Profit	25.0%	%					\$8.70
Subtotal							\$43.48
Bond	1.5%	%					\$0.65
Subtotal							\$44.13
Estimating Contingency	10.0%	%					\$4.41
Total Probable Construction Cost		Not i	ncluding	\$10.00	rebate pe	r fixture	\$48.54
D1. F34T12 & F40T12, 1 Lamp Fixtur	res: Re		Lamps				7.0.07
Electronic Ballast: 6250-01-353-7722	1	EA	\$4.70	\$4.70	\$25.00	\$25.00	\$29.70
F32T8 Lamp: 6240-01-344-9943 or 9508	1	EA	Inclu		\$2.83	\$2.83	\$2.83
Subtotal				\$4.70	7=.50	\$27.83	\$32.53
Arizona Transaction Privilege Tax	3.75%	%				\$1.04	\$1.04
Subtotal							\$33.57
Contractor OH & Profit	25.0%	%					\$8.39
Subtotal Rond	4 501	<b></b> ,					\$41.97
Bond Subtotal	1.5%	%					\$0.63
Estimating Contingency	10.0%	%					\$42.60
Total Probable Construction Cost	10.076		ncluding	\$9.00	rebate pe	r fiytura	\$4.26 \$46.86
I Januario Adiioti della (1001)	L	INVL	iiciaaniy	<b>∓3.00</b>	renate he	: IIXLUTE	740.86

Date Prepa						Sheet	of	
CONSTRUCTION COST ESTIMATE					January 1995 2			
Project					TY 1995 2 6  [Basis for Estimate			
Project No.  ECIP Facility Energy Improvements						stimate		
Location	113			i	-			
Fort Huachuca, Arizona	Code A too	design com	matad)					
Engineer-Architect	Sode A His	design com	peted)					
Keller & Gannon								
Drawing No.		Estimat	or		Checked By	1		
Lighting ECO Unit Costs			BIH		RCL			
	Quar				Ma			
Line Item	No. Units	Unit	Per	Total	Per	7-4-1	Total	
DO F04T40 0 F40T40 0 1 F: 4	<u> </u>	Meas.	Unit	Total	Unit	Total	Cost	
D2. F34T12 & F40T12, 2 Lamp Fixtu	res: Re	place	Lamps	and Ba	llasts			
Electronic Ballast:120V=6250-01-379-1917;	1 1	EA	\$5.29	\$5.29	\$25.00	\$25.00	\$30.29	
or Electronic Ballast:277V=6250-01-379-3041								
F32T8 Lamp: 6240-01-344-9943 or 9508	2	EA	Incl	uded	\$2.83	\$5.66	\$5.66	
Subtotal		<u> </u>		\$5.29		\$30.66	\$35.95	
Arizona Transaction Privilege Tax	3.75%	%			<del> </del>	\$1.15	\$1.15	
Subtotal Contractor OH & Profit	25.00	-					\$37.10	
Subtotal	25.0%	%		<u> </u>	ļ		\$9.27	
Bond	4.50/	0,					\$46.37	
Subtotal	1.5%	%		<u> </u>	<del> </del>		\$0.70	
Estimating Contingency	10.00/	%					\$47.07	
Total Probable Construction Cost	10.0%			040.00	<u> </u>	<u> </u>	\$4.71	
			including		rebate pe	er tixture	\$51.77	
D5. F34T12 & F40T12, 4 Lamp Fixtu	res. De	amp	to 3 Lai	mps and	Ballast	S	<del>,</del>	
Electronic Ballast:120V=6250-01-364-2997; or 277V=6250-01-364-2998	1	EA	\$7.05	\$7.05	\$36.44	\$36.44	\$43.49	
F32T8 Lamp: 6240-01-344-9943 or 9508			1	<u>Li</u>	L.:			
Reflector Retrofit for Delamping: R302-348T8	3	EA	incit	uded	\$2.83	\$8.49	\$8.49	
SSB 2'x4' for 3xF32T8	1	EA	\$4.23	\$4.23	\$49.00	\$49.00	\$53.23	
Subtotal				\$7.05		644.00	<u> </u>	
Arizona Transaction Privilege Tax	3.75%	%		\$7.05		\$44.93	\$51.98	
Subtotal	3.7376	70		-		\$1.68	\$1.68	
Contractor OH & Profit	25.0%	%				<u> </u>	\$53.66	
Subtotal	23.078	/0			<u> </u>	<u> </u>	\$13.41	
Bond	1.5%	%			<del> </del>		\$67.07	
Subtotal	1.570	70				<b> </b>	\$1.01 \$68.08	
Estimating Contingency	10.0%	%				<u> </u>	\$6.81	
Total Probable Construction Cost	10.070		including	\$19.00	rebate pe	r fivture	\$74.89	
E1. F48T12HO, 2 Lamp Fixtures: Re	place F	-yieti	na Ralla	ete with	Flactro	nic Rall	ete	
or Electronic Ballast: 277V=6250-01-383-	Piace	-71911	ng Dana	SIS WILL	LICCHO	INC DAIL	1313	
4540	1	EA	\$4.70	\$4.70	\$25.00	\$25.00	\$29.70	
Subtotal				\$4.70	<b></b>	\$25.00	\$29.70	
Arizona Transaction Privilege Tax	3.75%	%		φ4.70		\$25.00	\$0.94	
Subtotal	0.70	/0		-		φυ.34	\$30.64	
Contractor OH & Profit	25.0%	%			<del>                                     </del>		\$7.66	
Subtotal					<b> </b>		\$38.30	
Bond	1.5%	%					\$0.57	
Subtotal		,,			<del> </del>		\$38.87	
Estimating Contingency	10.0%	%					\$3.89	
Total Probable Construction Cost	. 3.0 /0		ncluding	\$4.00	rebate pe	r fixture	\$42.76	
		1101	uumy	<b>44.00</b>	ienate he	i iiklule	744.70	

				Date Prepa	red	Sheet	of	
					ry 1995 <b>3</b> 6			
Project ECIP Facility Energy Improveme	nts			Project No.	Basis for Es			
Location				l	1			
Fort Huachuca, Arizona						design_com	peted)	
Engineer-Architect						-		
Keller & Gannon								
Drawing No.	Estimator Checked By						•	
Lighting ECO Unit Costs						RCL		
Line Item	No.	itity I Unit	Per La	bor	Per Ma	iterial	Total	
	Units	Meas.	Unit	Total	Unit	Total	Cost	
F1. F96T12, 2 Lamp Fixtures: Repla	ace Lan	ips ai	nd Balla	sts	-	1	-I	
Electronic Ballast:120V=6250-01-377-7376;					005.00	005.00		
or:277V=6250-01-381-4453	1	EA	\$7.05	\$7.05	\$35.00	\$35.00	\$42.05	
F96T8 Lamp: 120V=6240-01-382-0105; or:	2	EA	la el	ıdad	610.00	620.55	400.55	
277V=6240-01-382-0108			incit	ıded	\$10.28	\$20.55	\$20.55	
Subtotal				\$7.05		\$55.55	\$62.60	
Arizona Transaction Privilege Tax	3.75%	%		-		\$2.08	\$2.08	
Subtotal							\$64.68	
Contractor OH & Profit	25.0%	%					\$16.17	
Subtotal	<u> </u>						\$80.85	
Bond	1.5%	%					\$1.21	
Subtotal							\$82.07	
Estimating Contingency	10.0%	%					\$8.21	
Total Probable Construction Cost			including		rebate pe	er fixture	\$90.27	
F2. F96T12, 4 Lamp Fixtures: Repla	ice Lam	ips ar	nd Balla	sts				
Electronic Ballast: Same as above	2	EA	\$7.05	\$14.10	\$35.00	\$70.00	\$84.10	
F96T8 Lamp: Same as above	4	EA	Inclu		\$10.28	\$41.10	\$41.10	
Subtotal	ļ			\$14.10		\$111.10	\$125.20	
Arizona Transaction Privilege Tax	3.75%	%					A 4 4 7	
Subtotal				-		\$4.17	\$4.17	
				-		\$4.17	\$129.37	
Contractor OH & Profit	25.0%	%		-		\$4.17	\$129.37 \$32.34	
Contractor OH & Profit Subtotal				-		\$4.17	\$129.37 \$32.34 \$161.71	
Contractor OH & Profit Subtotal Bond	25.0%	%		-		\$4.17	\$129.37 \$32.34 \$161.71 \$2.43	
Contractor OH & Profit Subtotal Bond Subtotal	1.5%	%		-		\$4.17	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency		%		-			\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost	1.5%	% % Not i	including		rebate pe	er fixture	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight:	1.5% 10.0% Replace	% Noti	p with C	ompact	Fluores	er fixture	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840	1.5%	% % Not i	<del></del>			er fixture	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact	1.5% 10.0% Replace	% Noti	p with C \$1.76	ompact \$1.76	Fluores \$5.79	er fixture scent Lai \$5.79	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact Fluorescent Lamp: 6240-01-345-2252	1.5% 10.0% Replace	% Noti	p with C	\$1.76 \$1.76	Fluores	er fixture scent Lai \$5.79 \$5.19	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55 \$6.95	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact Fluorescent Lamp: 6240-01-345-2252 Subtotal	1.5% 10.0% Replace	% Not is Lam EA EA	p with C \$1.76	ompact \$1.76	Fluores \$5.79	scent Lai \$5.79 \$5.19 \$10.98	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55 \$6.95	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact Fluorescent Lamp: 6240-01-345-2252 Subtotal Arizona Transaction Privilege Tax	1.5% 10.0% Replace	% Noti	p with C \$1.76 \$1.76	\$1.76 \$1.76 \$1.53	\$5.79 \$5.19	\$5.79 \$5.19 \$10.98 \$0.41	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55 \$6.95 \$14.50 \$0.41	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact Fluorescent Lamp: 6240-01-345-2252 Subtotal Arizona Transaction Privilege Tax Subtotal	1.5% 10.0% Replace 1 1	% Not it EA EA	p with C \$1.76 \$1.76	\$1.76 \$1.76 \$1.76 \$3.53 - Not an EC	\$5.79 \$5.19 CIP Project	scent Lar \$5.79 \$5.19 \$10.98 \$0.41	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55 \$6.95 \$14.50 \$0.41 \$14.91	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact Fluorescent Lamp: 6240-01-345-2252 Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit	1.5% 10.0% Replace	% Not is Lam EA EA	p with C \$1.76 \$1.76 Repla	\$1.76 \$1.76 \$3.53 - Not an EC	\$5.79 \$5.19 SIP Projectare Screw	\$5.79 \$5.19 \$10.98 \$0.41	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55 \$6.95 \$14.50 \$0.41 \$14.91 \$3.73	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact Fluorescent Lamp: 6240-01-345-2252 Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal	1.5% 10.0% Replace 1 1 3.75% 25.0%	% Not is Lam EA EA %	p with C \$1.76 \$1.76 Repla	\$1.76 \$1.76 \$3.53 - Not an EC acements re modifyi	\$5.79 \$5.19 \$P Project are Screwing "Perma	\$5.79 \$5.19 \$10.98 \$0.41 t	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55 \$6.95 \$14.50 \$0.41 \$14.91 \$3.73 \$18.64	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact Fluorescent Lamp: 6240-01-345-2252 Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond	1.5% 10.0% Replace 1 1	% Not it EA EA	p with C \$1.76 \$1.76 Repla	\$1.76 \$1.76 \$3.53 - Not an EC acements re modifyinare availa	\$5.79 \$5.19 \$Frojecting "Permander Screwing"	\$5.79 \$5.19 \$10.98 \$0.41 t	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55 \$6.95 \$14.50 \$0.41 \$14.91 \$3.73 \$18.64 \$0.28	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact Fluorescent Lamp: 6240-01-345-2252 Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal	1.5% 10.0% Replace 1 1 3.75% 25.0%	% Not it EA EA % %	p with C \$1.76 \$1.76 Repla	\$1.76 \$1.76 \$3.53 - Not an EC acements re modifyinare availa	\$5.79 \$5.19 \$P Project are Screwing "Perma	\$5.79 \$5.19 \$10.98 \$0.41 t	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55 \$6.95 \$14.50 \$0.41 \$14.91 \$3.73 \$18.64 \$0.28 \$18.92	
Contractor OH & Profit Subtotal Bond Subtotal Estimating Contingency Total Probable Construction Cost G1. Incandescent 60W Downlight: Adaptor Base: 6250-01-381-6840 DTT 13W, 2700K CRI 82 Compact Fluorescent Lamp: 6240-01-345-2252 Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond	1.5% 10.0% Replace 1 1 3.75% 25.0%	% Not is Lam EA EA % % %	p with C \$1.76 \$1.76 Repla	\$1.76 \$1.76 \$3.53 - Not an EC acements re modifyinare availa	\$5.79 \$5.19 \$Frojecting "Permander Screwing"	scent Lai \$5.79 \$5.19 \$10.98 \$0.41 ti	\$129.37 \$32.34 \$161.71 \$2.43 \$164.14 \$16.41 \$180.55 mp \$7.55 \$6.95 \$14.50 \$0.41 \$14.91 \$3.73 \$18.64 \$0.28	

				Date Prepar	red	Sheet	of
CONSTRUCTION COST ESTIMATE				Janua	ry 1995	4	6
Project Pro					Basis for Es	timate	
ECIP Facility Energy Improvement	nts						
Location				L.,	1		
Fort Huachuca, Arizona						design com	peted)
Engineer-Architect					1		, ,
Keller & Gannon							
Drawing No.		Estimat	or		Checked By		
Lighting ECO Unit Costs	BIH			RCL			
	Quar		Labor			Material	
Line Item	No. Units	Unit Meas.	Per Unit	Total	Per Unit	Total	Total Cost
G2. Incandescent 75W Downlight:						scent La	
TRI 20W, 2700K CRI 82 Compact Fluor.	Teplace	Lan	ip with C	Julipaci	riuores	Scent Lai	uh
Lamp / Adaptor: 6240-01-345-2252	1	EA	\$3.53	\$3.53	\$5.19	\$5.19	\$8.72
Subtotal	+	<b>-</b>		\$3.53		\$5.19	\$8.72
Arizona Transaction Privilege Tax	3.75%	%		Ψυ.υυ	<del> </del>	\$0.19	\$0.72
Subtotal	0.7070	/*		Not an E	I CIP Projec		\$8.91
Contractor OH & Profit	25.0%	%	4		-		\$2.23
Subtotal	20.070	/*	Replacements are Screw-In, or Fixture modifying "Permatwist"				\$11.14
Bond	1.5%	%	4	are availa		\$0.17	
Subtotal	1		""""		Projects	000t	\$11.30
Estimating Contingency	10.0%	%					\$1.13
Total Probable Construction Cost	10.075		including	\$5.00	rebate pe	r fixture	\$12.43
G3. Incand. 40W Ceiling or Wall-Mo	unt Fixt			i			
Adaptor Base: 6250-01-381-7189	1	EA.	\$1.76	\$1.76	\$5.55	\$5.55	\$7.32
TT 7W, 4100K CRI 85 Compact Fluorescent	1		·	· ·		Ψ0.00	Ψ1.02
Lamp: 6240-01-352-0434	1	EA	\$1.76	\$1.76	\$2.49	\$2.49	\$4.25
Subtotal				\$3.53		\$8.04	\$11.57
Arizona Transaction Privilege Tax	3.75%	%		-		\$0.30	\$0.30
Subtotal		<u> </u>		Not an E	CIP Projec		\$11.87
Contractor OH & Profit	25.0%	%			are Screw		\$2.97
Subtotal			<del></del>				
Bond	1.5%	%	Fixture modifying "Permatwist"  fittings are available at similar cost				
Subtotal			····) ··· ·· ·· ·· ·· ·· ·· ·· ·· ·· ··				\$15.06
Estimating Contingency	10.0%	%					\$1.51
Total Probable Construction Cost		Not	including	\$3.00	rebate pe	er fixture	\$16.57
G4. Incand. 60W Ceiling or Wall-Mo		-			ompact	Fluoresc	ent
A	unt Fixt	ture:	Replace	ement C	OIIIP WOL		
Adaptor Base: 6250-01-381-6840	unt Fixt	ture: EA	Replace \$1.76	\$1.76	\$5.55	\$5.55	
	1	EA	\$1.76	\$1.76	\$5.55	\$5.55	\$7.32
Adaptor Base: 6250-01-381-6840							
Adaptor Base: 6250-01-381-6840 DTT 13W, 3500K CRI 82 Compact Fluorescent Lamp: 6240-01-352-0438 Subtotal	1	EA	\$1.76	\$1.76	\$5.55	\$5.55	\$7.32
Adaptor Base: 6250-01-381-6840 DTT 13W, 3500K CRI 82 Compact Fluorescent Lamp: 6240-01-352-0438	1	EA	\$1.76	\$1.76 \$1.76	\$5.55	\$5.55 \$5.88	\$7.32 \$7.64
Adaptor Base: 6250-01-381-6840 DTT 13W, 3500K CRI 82 Compact Fluorescent Lamp: 6240-01-352-0438 Subtotal	1	EA EA	\$1.76 \$1.76	\$1.76 \$1.76 \$3.53	\$5.55 \$5.88	\$5.55 \$5.88 \$11.43 \$0.43	\$7.32 \$7.64 \$14.96
Adaptor Base: 6250-01-381-6840 DTT 13W, 3500K CRI 82 Compact Fluorescent Lamp: 6240-01-352-0438 Subtotal Arizona Transaction Privilege Tax	1	EA EA	\$1.76 \$1.76	\$1.76 \$1.76 \$3.53 - Not an EC	\$5.55	\$5.55 \$5.88 \$11.43 \$0.43	\$7.32 \$7.64 \$14.96 \$0.43
Adaptor Base: 6250-01-381-6840 DTT 13W, 3500K CRI 82 Compact Fluorescent Lamp: 6240-01-352-0438 Subtotal Arizona Transaction Privilege Tax Subtotal	1 1 3.75%	EA EA %	\$1.76 \$1.76 Repla	\$1.76 \$1.76 \$3.53 - Not an EC	\$5.55 \$5.88 CIP Projec	\$5.55 \$5.88 \$11.43 \$0.43 et	\$7.32 \$7.64 \$14.96 \$0.43 \$15.39
Adaptor Base: 6250-01-381-6840 DTT 13W, 3500K CRI 82 Compact Fluorescent Lamp: 6240-01-352-0438 Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond	1 1 3.75%	EA EA %	\$1.76 \$1.76 Repla	\$1.76 \$1.76 \$3.53 - Not an EC acements re modifyi	\$5.55 \$5.88 CIP Project are Screw	\$5.55 \$5.88 \$11.43 \$0.43 at In, or atwist"	\$7.32 \$7.64 \$14.96 \$0.43 \$15.39 \$3.85
Adaptor Base: 6250-01-381-6840 DTT 13W, 3500K CRI 82 Compact Fluorescent Lamp: 6240-01-352-0438 Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond Subtotal	3.75% 25.0%	EA EA %	\$1.76 \$1.76 Repla	\$1.76 \$1.76 \$3.53 - Not an EC acements re modifyi are availa	\$5.55 \$5.88 CIP Project are Screwing "Perma	\$5.55 \$5.88 \$11.43 \$0.43 at In, or atwist"	\$7.32 \$7.64 \$14.96 \$0.43 \$15.39 \$3.85 \$19.23
Adaptor Base: 6250-01-381-6840 DTT 13W, 3500K CRI 82 Compact Fluorescent Lamp: 6240-01-352-0438 Subtotal Arizona Transaction Privilege Tax Subtotal Contractor OH & Profit Subtotal Bond	3.75% 25.0%	EA	\$1.76 \$1.76 Repla	\$1.76 \$1.76 \$3.53 - Not an EC acements re modifyi are availa	\$5.55 \$5.88 CIP Project are Screwing "Perma ble at simi	\$5.55 \$5.88 \$11.43 \$0.43 at In, or atwist"	\$7.32 \$7.64 \$14.96 \$0.43 \$15.39 \$3.85 \$19.23 \$0.29

					Date Prepared S		of	
				Janua	ıry 1995	5	6	
Project				Basis for Es	stimate			
ECIP Facility Energy Improveme	nts				1			
Location					1			
Fort Huachuca, Arizona						design com	peted)	
Engineer-Architect								
Keller & Gannon Drawing No.		Te						
Lighting ECO Unit Costs		Estima			Checked By	RCL		
Lighting ECO Unit Costs		Quantity Labo					<u>L</u>	
Line Item	No.	Unit	Per	IDOF	Per Ma	teriai	Total	
	Units	Meas.	Unit	Total	Unit	Total	Cost	
G5. Incandescent 100W Ceiling Fixt	ure: R	eplac	e Lamp	with Co	mpact F	luoresce	nt	
TRI 23W, 2700K CRI 82 Compact Fluor.	T		Ĩ		1	1451556	1	
Lamp / Adaptor: 6240-01-367-5734	1	EA	\$3.53	\$3.53	\$18.07	\$18.07	\$21.59	
Subtotal	<del>                                     </del>	$\vdash$		\$3.53		\$18.07	\$21.59	
Arizona Transaction Privilege Tax	3.75%	%		-		\$0.68	\$0.68	
Subtotal	1	1		Not an F	CIP Projec		\$22.27	
Contractor OH & Profit	25.0%	%	Repla		are Screw		\$5.57	
Subtotal			4		ing "Perma	\$27.84		
Bond	1.5%	%					\$0.42	
Subtotal			fittings are available at similar cost for ECIP Projects				\$28.26	
Estimating Contingency	10.0%	%			<u> </u>	I	\$2.83	
Total Probable Construction Cost		Not	including \$5.00 rebate per fixtur				\$31.08	
H1. Incandescent 60W & 75W Table	Lamps							
17W Compact Fluorescent Covered Lamp:		1			T Tu	JI GSCGIII	. <u>s</u>	
6240-01-368-6966	1	EA	\$3.53	\$3.53	\$11.76	\$11.76	\$15.29	
Subtotal				\$3.53		\$11.76	\$15.29	
Arizona Transaction Privilege Tax	3.75%	%		-	<del>                                     </del>	\$0.44	\$0.44	
Subtotal		,,,		\$15.73				
Contractor OH & Profit	25.0%	%	4		CIP Projec are Screw		\$3.93	
Subtotal							\$19.66	
Bond	1.5%	%	Fixture modifying "Permatwist" fittings are available at similar cost				\$0.29	
Subtotal			for ECIP Projects				\$19.95	
Estimating Contingency	10.0%	%	10. 20. 110,00.				\$2.00	
Total Probable Construction Cost		Not	including	\$5.00	rebate pe	r fixture	\$21.95	
J1. 250W MV Pendant-Mount Fixture	e: Repl				vith HPS	· · · · · · · · · · · · · · · · · · ·	421.00	
Ballast, 150W S-55: 6250-01-352-8004	1	EA	\$19.04	\$19.04	\$91.34	\$91.34	\$110.38	
HPS Lamp 150W ANSI S-55 B-17 Coated:						Ψυ1.υΨ	Ψ110.30	
6240-01-142-8452	1	EA	\$6.35	\$6.35	\$12.91	\$12.91	\$19.26	
Subtotal	<u> </u>			\$25.38		\$104.25	\$129.63	
Arizona Transaction Privilege Tax	3.75%	%		Ψ20.00		\$3.91	\$3.91	
Subtotal						ψυ.σ ι	\$133.54	
Contractor OH & Profit	25.0%	%			<u> </u>		\$33.38	
Subtotal		,,,					\$166.92	
Bond	1.5%	%					\$2.50	
Subtotal	1						\$169.43	
Estimating Contingency	10.0%	%					\$16.94	
Total Probable Construction Cost	<del></del>	Less	\$100	rebate pe			\$186.37	

	Date Prepa	Date Prepared Sheet					
					ry 1995	6	6
Project				Project No.	Basis for Es	-	
ECIP Facility Energy Improvemen	İ	ļ					
Location				•	1		
Fort Huachuca, Arizona	Code A (no	design com	peted)				
Engineer-Architect							
Keller & Gannon Drawing No.		Estimat					
Lighting ECO Unit Costs		Checked By					
Lighting ECO Offit Costs	BIH Quantity Lab		hor	140	RCL Material		
Line item	No.	Unit	Per	T	Per	tenai	Total
	Units	Meas.	Unit	Total	Unit	Total	Cost
J2. 400W MV Pendant-Mount Fixture	: Repi	lace L	.amp &	Ballast v	with HPS	<del>}</del>	
Ballast, 200W S-66: 6250-01-348-5325	1	EA	\$19.46	\$19.46	\$67.35	\$67.35	\$86.81
HPS Lamp 200W ANSI S-66 ED-18 Coated:		FA	60.05	00.05	040.44		
6240-01-178-9113	1	EA	\$6.35	\$6.35	\$16.44	\$16.44	\$22.79
Subtotal				\$25.80		\$83.79	\$109.59
Arizona Transaction Privilege Tax	3.75%	%		_		\$3.14	\$3.14
Subtotal							\$112.74
Contractor OH & Profit	25.0%	%					\$28.18
Subtotal							\$140.92
Bond	1.5%	%					\$2.11
Subtotal							\$143.03
Estimating Contingency	10.0%	%					\$14.30
Total Probable Construction Cost		Less	\$100	er kW sav	ed.	\$157.34	
K1. Occupancy Sensor Control: Cei	iling M						
Occupancy Sensor: PIR or Ultra Sonic	1	EA	\$24.17	\$24.17	\$86.00	\$86.00	\$110.17
Sensor Transformer Pack	1	EA	\$16.92	\$16.92	\$30.00	\$30.00	\$46.92
Wiremold Raceway & 3/C #18 Wire	25	LF	\$1.58	\$39.57	\$0.65	\$16.25	\$55.82
Subtotal				\$39.57		\$132.25	\$212.92
Arizona Transaction Privilege Tax	3.75%	%				\$4.96	\$4.96
Subtotal Contractor OH & Profit	05.004	0/					\$217.88
	25.0%	%					\$54.47
Subtotal	4.504						\$272.35
Bond Subtotal	1.5%	%					\$4.09
Estimating Contingency	40.00/	%					\$276.43
	10.0% For 2 to			£4.00			\$27.64
·	For 5+ F			\$4.00 \$8.00	rebate pe		\$304.07
K3. Occupancy Sensor Control: Aut					rebate pe	r sensor	
Occupancy Sensor: PIR or Ultra Sonic						004.00	<b>A3</b> 4 <b>A</b> 4
Subtotal	1	EA	\$7.04	\$7.04	\$64.00	\$64.00	\$71.04
Arizona Transaction Privilege Tax	3.75%	%		\$7.04		\$64.00	\$71.04
Subtotal	3.13%	70				\$2.40	\$2.40
Contractor OH & Profit	25.0%	%					\$73.44
Subtotal	20.076	70		<u> </u>			\$18.36
Bond	1.5%	%					\$91.80
Subtotal	1.570	/0					\$1.38 \$93.18
					1 .		ψ33.10
	10 0%	%					<b>\$0.22</b>
Estimating Contingency	10.0% For 2 to	%	IIFAS	\$4.00	rebate pe	reancar	\$9.32 <b>\$102.50</b>